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BB REFERENCE

**CONTENTS** 

**DESCRIPTION** 

TITLE SHEET

SITE PLAN

BORE LOGS

PROFILE

LEGEND (SOIL)

CROSS SECTIONS

SHEET NO.

4-5

6-7

8-12

36030

# STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

# **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY HENDERSON
PROJECT DESCRIPTION 1-26 FROM US-25 BUS (EXIT 44)
TO NEAR NC-280 (EXIT 40): REPLACE BRDG #0232
OVER I-26 & ON SR-I345 (BUTLER BRDG RD)
SITE DESCRIPTIONREPLACE BRDG #0232

STATE PROJECT REFERENCE NO. TOTAL SHEETS BB I-4400C

#### **CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (1919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNDS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE DESTREE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS,

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DIES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OF FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS FOR THE THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

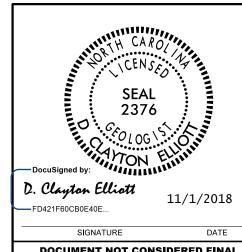
- NOTES:

  1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.

  2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

DC CHEEK CJ COFFEY CD JOHNSON DC ELLIOTT INVESTIGATED BY \_DC ELLIOTT DRAWN BY \_ DC ELLIOTT CHECKED BY JC KUHNE SUBMITTED BY JC KUHNE 11/1/2018

PERSONNEL



DOCUMENT NOT CONSIDERED FINAL **UNLESS ALL SIGNATURES COMPLETED** 

PROJECT REPERENCE NO. SHEET NO.

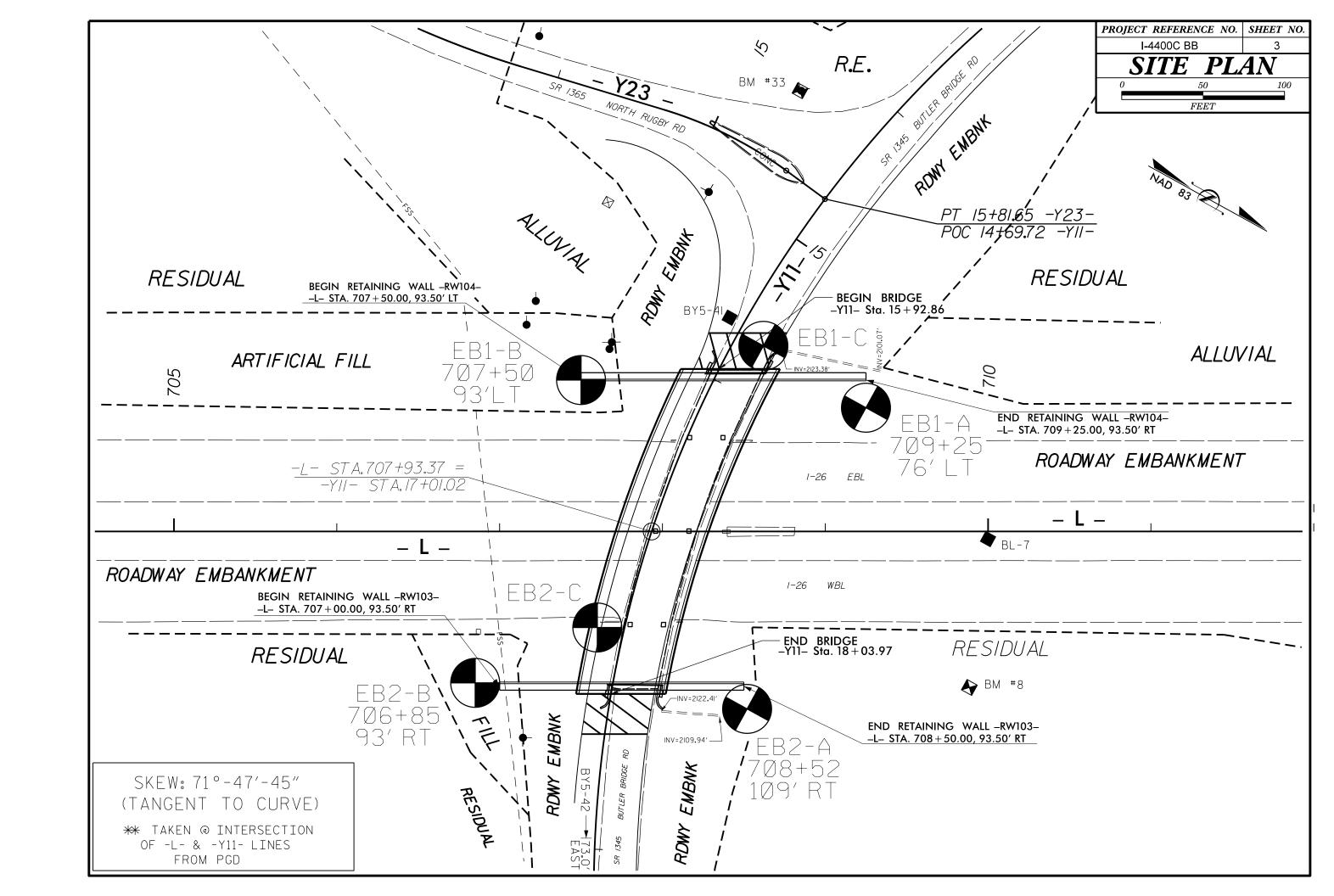
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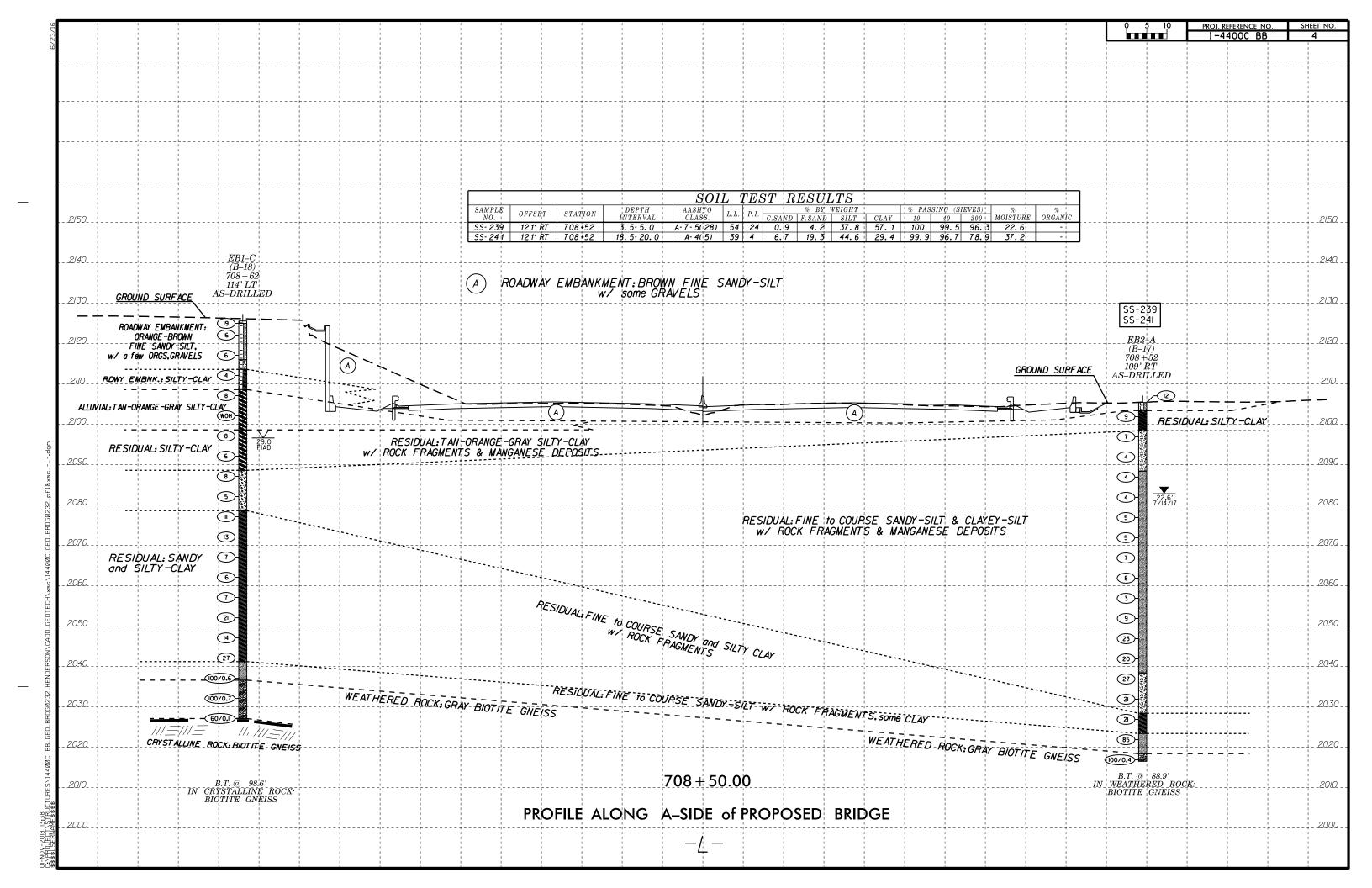
# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

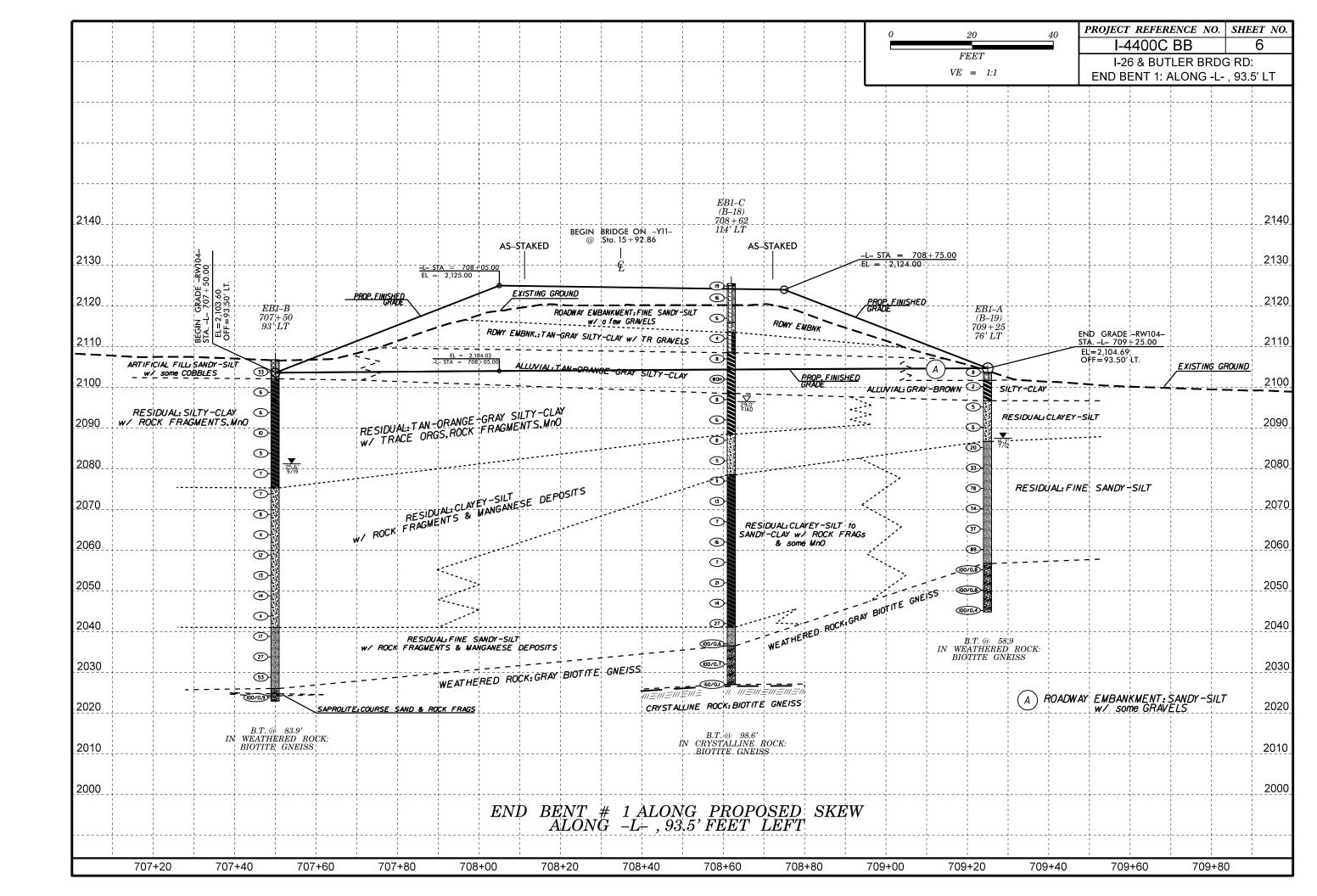
# SUBSURFACE INVESTIGATION

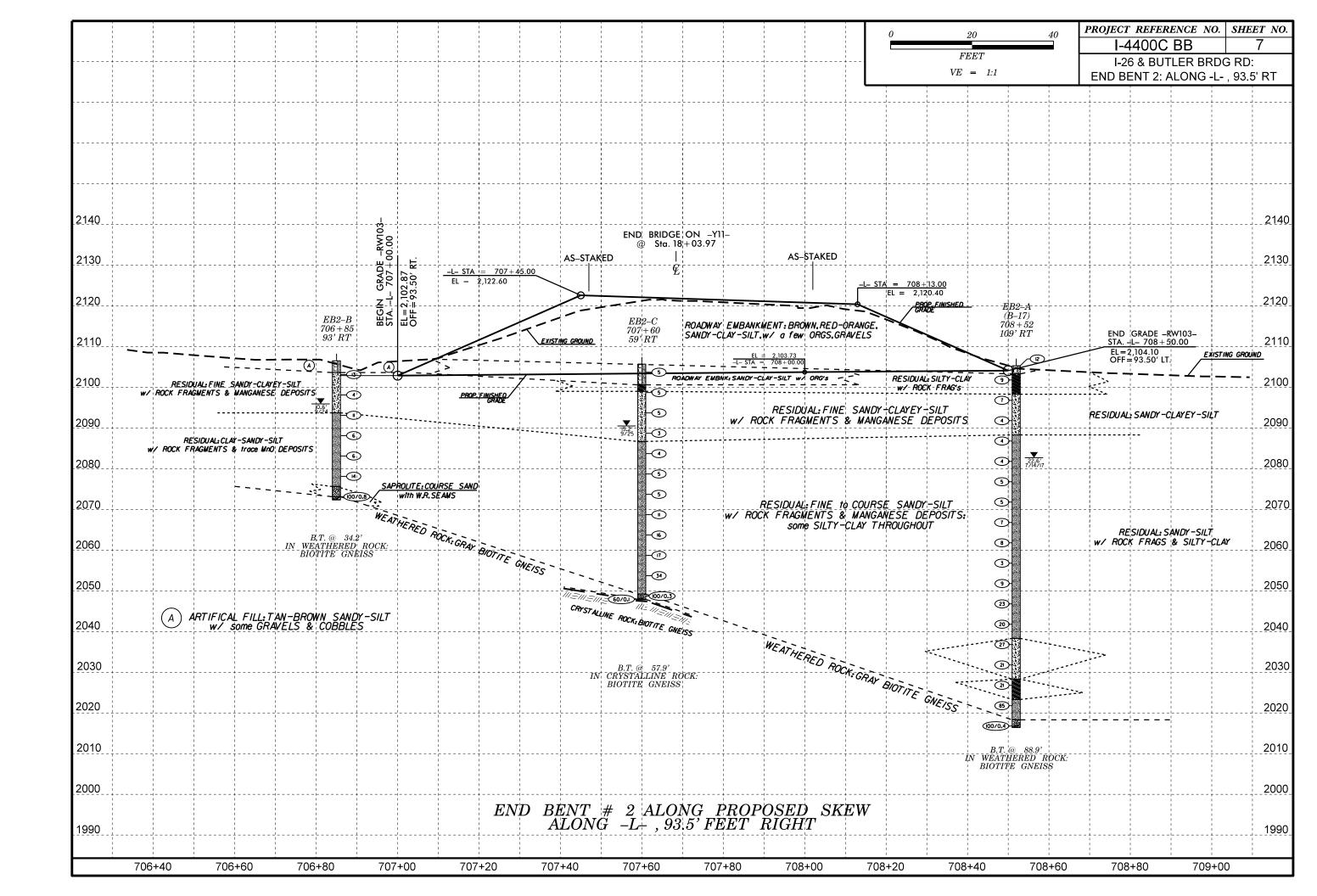
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST MASKITO T 206, ASTM D1586, SOIL CLASSIFICATION IS BASED ON THE AGSHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, ASSHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.  UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.  GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.  ANGULARITY OF GRAINS	HARD ROCK IS NON-COASTAL PLAIM MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIM MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN Ø.I FOOT PER 6Ø BLOWS IN NON-COASTAL PLAIM MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.  ADUIFER - A WATER BEARING FORMATION OR STRATA,  ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,  VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDOED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6  SOIL LEGEND AND AASHTO CLASSIFICATION  GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:  ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.  MINERALOGICAL COMPOSITION	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:  WEATHERED ROCK (WR) NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.  ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH ID ODES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
CLASS. (\$\langle 3\text{PASSING \$\frac{1}{2}\text{PASSING \$\frac{1}{2}	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.  ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.  COMPRESSIBILITY	CRYSTALLINE ROCK (CR)  NON-CRYSTALLINE ROCK (CR)  NON-CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE. GREISS, GABBRO, SCHIST, ETC.  NON-CRYSTALLINE ROCK (NCR)  SEDIMENTARY ROCK THAT WOULD YELD SPT REFUSAL IF TESTED.	SURFACE.  - CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  - COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAYITY ON SLOPE OR AT BOTTOM
SYMBOL	SLIGHTLY COMPRESSIBLE LL < 31 - 50  MODERATELY COMPRESSIBLE LL = 31 - 50  HIGHLY COMPRESSIBLE LL > 50  PERCENTAGE OF MATERIAL	COASTAL PLAIN  COASTAL PLAIN  COASTAL PLAIN  SEDIMENTARY ROCK  SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED  (CP)  SHELL BEDS, ETC.	OF SLOPE. <u>CORE RECOVERY (REC.)</u> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <u>DIKE</u> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*40 30 MX 50 MX 51 MN 55 MX 51 MN	ORGANIC MATERIAL CRANULAR SILT - CLAY SOILS SOILS TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.  VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	ROCKS OR CUTS MASSIVE ROCK.  DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
LL	MODERATELY ORGANIC         5 - 10%         12 - 20%         SOME         20 - 35%           HIGHLY ORGANIC         > 10%         > 20%         HIGHLY         35% AND ABOVE   GROUND WATER	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.  SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.  FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. OF MAJOR GRAVEL AND MATERIALS SAND GRAVEL AND SAND GRAVEL AND SAND SOILS SOILS  SOILS SOILS  FAIR SAND GRAVEL AND SAND SOILS SOILS	■ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING     ■ STATIC WATER LEVEL AFTER 24 HOURS     □ PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALINE ROCKS RING UNDER HAMMER BLOWS.  MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN (MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
CEN. RATING   EXCELLENT TO GOOD   FAIR TO POOR   FAIR TO POOR   UNSUITABLE	SPRING OR SEEP  MISCELLANEOUS SYMBOLS	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.  MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM, FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
PRIMARY SOIL TYPE COMPACTNESS OR COM	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES	(MOD. SEV.)  AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK.  IF TESTED, WOULD YIELD SPT REFUSAL  SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT  (SEV.)  REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAQLINIZED	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
GENERALLY VERY LOOSE 4 4 TO 100 GRANULAR MEDIUM DENSE 10 TO 300 N/A MATERIAL DENSE 30 TO 50 VERY DENSE > 50	SOIL SYMBOL  SOIL	TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.  IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF  VERY  ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE  BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  MOTILED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS  USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2	INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD  THE	(V SEV.)  REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	OF AN INTERVENING IMPERVIOUS STRATUM.  RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
(COHESIVE)         VERY STIFF         15 TO 30         2 TO 4           HARD         > 30         > 4	PIEZOMETER SPT N-VALUE	SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE.  ROCK HARDNESS	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.  SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PAREN'
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS  UNDERCUT  UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE  UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE UNDERCUT  UNDERCUT  UNDERCUT  UNDERCUT  UNDERCUT  UNDERCUT  ACCEPTABLE DEGRADABLE ROCK	VERY HARD  CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.  HARD  CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	ROCK. <u>SILL</u> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BUDGLER         COBBLE         GRAVEL         SAND         SAND         SAND         (SL.)         CCL1           (GRAIN MM 305         75         2.0         0.25         0.05         0.005	ABBRE VIATIONS  AR - AUGER REFUSAL  MED MEDIUM  VST - VANE SHEAR TEST	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.  STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3  SOIL MOISTURE - CORRELATION OF TERMS	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 <sub>d</sub> - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	MEDIUM  CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.  CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE DESCRIPTION  OESCRIPTION  - SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.)  (SAT.) FROM BELOW THE GROUND WATER TABLE	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS  DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK  e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROVEN BY FINGER PRESSURE.  VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.  STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
PLASTIC PAGE - WET - (W) SEMISOLID: REQUIRES DRYING TO	F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI - SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.  TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(PI) PL PLASTIC LIMIT	FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING HI HIGHLY V - VERY RATIO  EQUIPMENT USED ON SUBJECT PROJECT	FRACTURE SPACING  TERM SPACING VERY WIDE  MORE THAN 10 FEET  SPACING VERY WIDE  MORE THAN 10 FEET  VERY THICKLY BEDDED  4 FEET	BENCH MARK: BY5-42: ON BUTLER BRDG RD, @ approxYII- sta, 19+66, 5.0' LT N: 621291.4266 E: 952969.298 ELEVATION: 2119,79 FEET
OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	DRILL UNITS:  ADVANCING TOOLS:  HAMMER TYPE:  X CME-45C  CLAY BITS  CME-55  G'CONTINUOUS FLIGHT AUGER  CORE SIZE:	WIDE         3 TO 10 FEET         THICKLY BEDDED         1.5 - 4 FEET           MODERATELY CLOSE         1 TO 3 FEET         THINLY BEDDED         0.16 - 1.5 FEET           CLOSE         0.16 TO 1 FOOT         VERY THINLY BEDDED         0.03 - 0.16 FEET           VERY CLOSE         LESS THAN 0.16 FEET         THICKLY LAMINATED         0.008 - 0.03 FEET           THINLY LAMINATED         < 0.008 FEET	NOTES: FIAD - FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY           PLASTICITY INDEX (PI)         DRY STRENGTH           NON PLASTIC         0-5         VERY LOW	CME-550	INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.  RUBBING WITH FINGER FREES NUMEROUS GRAINS;  FRIABLE  FRIABLE  FRIABLE  FRIABLE  FRIABLE  FRIABLE  FRIABLE  FRIABLE	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH  COLOR	VANE SHEAR TEST CASING W/ ADVANCER HAND TOOLS:  PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER  TRICONE TRICONE SOUNDING ROD	MODERATELY INDURATED  GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.  INDURATED  GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	••NOTE: FROM GEU: SOME BORINGS HAVE THE ORIGINAL "B-x" DESIGNATOR INCLUDED IN THE BOREHOLE NAME TO CORRELATE w/ THE ORIGINAL
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.  EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.	NAME OF THAT BORING FROM THE 2017 RDWY DRILLING PROGRAM  DATE: 8-15-1





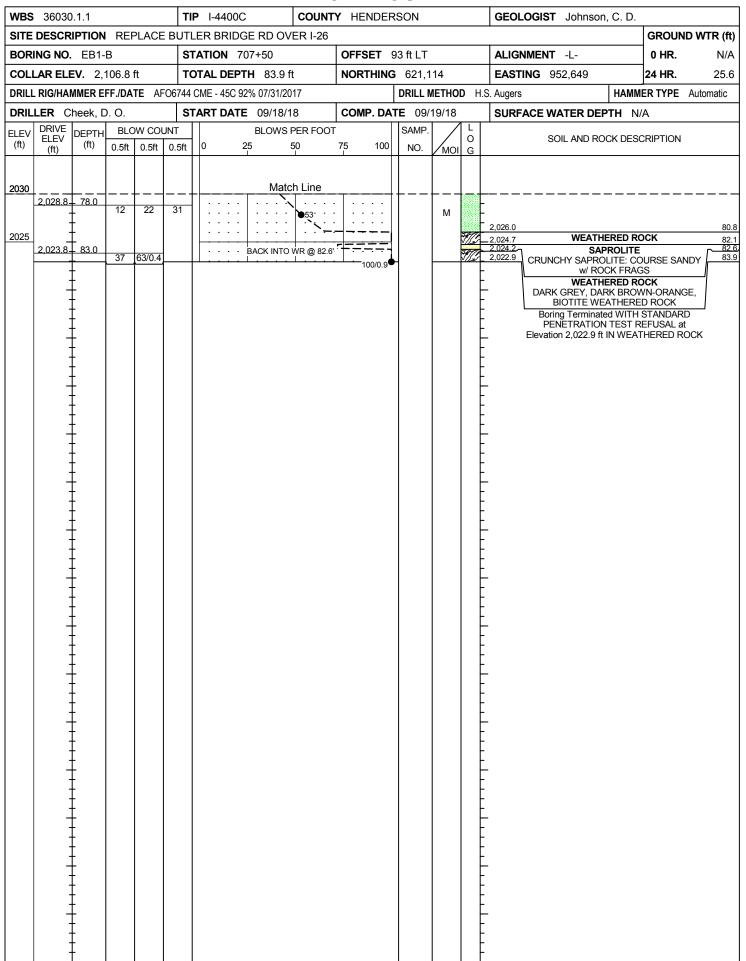




#### **WBS** 36030.1.1 **TIP** I-4400C COUNTY HENDERSON **GEOLOGIST** J. Cranston SITE DESCRIPTION I-26 from US 25 Business (Exit 44) to near NC 280 (Exit 40) **GROUND WTR (ft) BORING NO.** EB1-A (B-19) **STATION** 709+25 OFFSET 64 ft LT ALIGNMENT -L-0 HR. 28.2 **NORTHING** 621,281 **EASTING** 952,590 **COLLAR ELEV.** 2,103.7 ft TOTAL DEPTH 58.9 ft 24 HR. 16.2 DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 86% 1/30/2017 DRILL METHOD H.S. Augers HAMMER TYPE Automatic COMP. DATE 07/12/17 DRILLER C. Boyce **START DATE** 07/11/17 SURFACE WATER DEPTH N/A ELEV DRIVE DEPTH BLOW COUNT SAMP. BLOWS PER FOOT SOIL AND ROCK DESCRIPTION (ft) 0.5ft 0.5ft 0.5ft 75 100 NO. (ft) DEPTH (ft 2105 GROUND SURFACE 2,103.7 0.0 ROADWAY EMBANKMENT M Brown, Fine Sandy SILT (A-4) with Trace Gravel and Organics (Roots) 2100 2,100.2 WOH WOH ALLUVIAL SS-21 27% . . . . Gray-Brown, Silty CLAY (A-7-6) RESIDUAL 2095 2,095.2 8.5 Red-Brown, Clayey SILT (A-5) М . . . . . . . 2090 2,090.2 13.5 . . . . . . . . . . . . . . . 2085 2,085.2 18.5 Μ 2080 2,080.2 23.5 М 2075 2,075.2 28.5 15 30 Μ 2070 2,070.2 33.5 30 31 М 2065 2,065.2 38.5 М 2060 2,060.2 43.5 14 30 59 Μ WEATHERED ROCK 2055 2,055.2 48.5 Light Brown (BIOTITE GNEISS) 35 65/0.3 100/0.8 2050 2,050.2 53.5 37 63/0.3 . . . 2045 2,045.2 58.5 100/0.4 Boring Terminated at Elevation 2,044.8 ft in WEATHERED ROCK (BIOTITE GNEISS)

								В	ORE L	UG					
WBS	36030	).1.1			TI	<b>P</b> I-4400C		COUNT	/ HENDER	SON			GEOLOGIST M. Arnold		
SITE	DESCR	IPTION	I I-26	from l	US 25	Business (Ex	(it 44) to r	near NC	280 (Exit 40	)				GROUN	ID WTR (ft)
BOR	ING NO.	EB1-	C (B-	18)	S	TATION 708	+62		OFFSET 1	02 ft LT	-		ALIGNMENT -L-	0 HR.	29.0
COLI	LAR ELE	<b>EV.</b> 2,	125.5	ft	т	OTAL DEPTH	98.6 ft		NORTHING	621,2	:07		<b>EASTING</b> 952,587	24 HR.	FIAD
DRILL	RIG/HAI	MMER E	FF./DA	TE F8	R3763	CME-550X 86%	1/30/2017			DRILL N	ИЕТНО	<b>D</b> H.	S. Augers HA	MMER TYPE	Automatic
DRIL	LER J.	Hoyle			S	TART DATE	08/09/17		COMP. DAT	<b>E</b> 08/0	09/17		SURFACE WATER DEPTH	N/A	
ELEV	DRIVE	DEPTH	BLC	W COL	JNT		BLOWS PE	R FOOT		SAMP.	<b>V</b> /		OOU AND DOOK D	FOODIDTION	
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	50	)	75 100	NO.	моі	O G	SOIL AND ROCK D	ESCRIPTION	DEPTH (ft)
2130															
	-	F										l F	<u>-</u>		
	-	F										ŀ	O 405 5 CDOLIND CL	DEACE	0.0
2125	2,124.9	0.6	9	10	9				<del>   </del>		l	1888	2,125.5 GROUND SL 2,124.9 ASPHA		0.0
	2.122.0	3.5		10	9	19					M		ROADWAY EME Brown, Fine Sandy SIL	ANKMENT Γ (A-4) with Tr	ace
2120	2,122.0	3.5	7	7	9	16					М		Mica, Gravel, and Mar	ganese Depos	sits
2120	-	<u> </u>				/							<b>-</b> ·		
	2,117.0	8.5			_	:/:::									
2115	-	_	3	3	3	6					М				ace 9.6
	-	_													12.0
	2,112.0	13.5	2	3	1	4					М		Grave		
2110	_	ŀ							+				_ - 2,108.5		17.0
	2.107.0	18.5				1   1   1							ALLUVI		
2105	-	<u> </u>	3	3	5	-•8	: : : :		: : : :		w		Orange-Gray and Tan-C (A-7) with Trace Organic	cs (Roots), Gra	LAY avel,
	-	F											and Manganese	Deposits	
	2,102.0	23.5	WOH	WOH	WOH						Cat				
2100	_	‡	***	WOII	WOII	0					Sat.		<del>-</del>		
	-	<u> </u>				\							2,098.5 <b>RESIDU</b>	AL	27.0
0005	2,097.0	28.5	3	3	5	. 8					-w-		Tan-Orange, Silty CLA Rock Fragr	Y (A-7) with tra	ace
2095	-	-											_	1101110	
	2,092.0	33.5													
2090	-	E	2	2	4	<b>●</b> 6					W		_		
	-	Ė				:   : : :							2,088.5 Tan-Orange, Clayey SIL	T (A 5) veith T	37.0
	2,087.0	38.5	2	4	4	.1					l w		Rock Fragr	nents	ace
2085	-	-										7 1	-		
	2.082.0	43.5										N V			
2080	-	-	2	2	3	5					w	7 2			
	-	F				1.						N. V			47.0
	2,077.0	48.5	3	4	7	$  :_L^T::  $					w		Tan-Orange, Fine to Co (A-6) with Trace Ro	arse Sandy Cl ck Fragments	_AY
2075	_	F				1111					**		· <del>-</del>		
	2.070.0	<u> </u>				::: ::									
2070	2,072.0	53.5	4	5	8	· · • 13·					w				
2010	-	‡				<del>  : : j : :  </del>							<b>-</b>		
	2,067.0	58.5				$\left  \left  \begin{array}{c} \cdot L & \cdot \cdot \\ \cdot L & \cdot \cdot \end{array} \right  \right $									
2065	-	<u> </u>	3	2	5	<b>●</b> 7 · ·					W		<del>-</del>		
	-	ţ				:\::									
	2,062.0	63.5	6	8	8						w				
2060	_	<u> </u>				1 /			+				<del>-</del>		
	2.057.0	68.5	L			$[[\cdot]]$									
2055			3	3	4	<b>●</b> 7 · ·					W				
	-	F				\							_		
	2,052.0	73.5	5	9	12	:::\;					۱۸/				
2050	_	<u> </u>	<u> </u>	Ľ		· · · · • • • • • • • • • • • • • •			1		W				

																	BORE	LOG					
WBS	360	30.1.1			<b>TIP</b> I-4400C	COUN	ITY HENDEF	RSON		GEOLOGIST M. Arnold		WBS	<b>3</b> 36030.1.1		TIF	P 1-4400C COUN	NTY HENDE	RSON		GEOLOGIST Johnso	n, C. D.		
SITE	DESC	RIPTIC	<b>DN</b> 1-26	from US	25 Business (Exit 44)	to near N	IC 280 (Exit 40	0)			GROUND WTR (ft)	SITE	DESCRIPTION	N REPLACE	E BUTL	ER BRIDGE RD OVER I-20	6				G	ROUND W	TR (ft)
BOR	ING N	D. EB	31-C (B	-18)	<b>STATION</b> 708+62		OFFSET	102 ft L	Γ	ALIGNMENT -L-	<b>0 HR.</b> 29.0	BOF	RING NO. EB1	-B	ST	<b>FATION</b> 707+50	OFFSET	93 ft LT		ALIGNMENT -L-	0	HR.	N/A
COL	LAR E	EV.	2,125.5	ft	TOTAL DEPTH 98.6	6 ft	NORTHING	621,2	207	<b>EASTING</b> 952,587	24 HR. FIAD	COL	LAR ELEV. 2	,106.8 ft	то	OTAL DEPTH 83.9 ft	NORTHIN	<b>IG</b> 621,114		<b>EASTING</b> 952,649	24	HR.	25.6
DRIL	RIG/H	AMMER	R EFF./DA	TE F&R37	63 CME-550X 86% 1/30/2	2017		DRILL I	METHOD	H.S. Augers HAMM	MER TYPE Automatic	DRIL	L RIG/HAMMER E	FF./DATE A	FO6744 (	CME - 45C 92% 07/31/2017		DRILL ME	THOD	H.S. Augers	HAMMER	TYPE Auto	matic
DRIL	LER	J. Hoy	le		START DATE 08/09	9/17	COMP. DA	TE 08/	09/17	SURFACE WATER DEPTH N	I/A	DRII	LER Cheek,	D. O.	ST	TART DATE 09/18/18	COMP. D.	ATE 09/19	/18	SURFACE WATER DE	PTH N/A		
ELEV (ft)		DED	TH BLO	OW COUNT	<b></b>	'S PER FOO	OT 75 100	SAMP.	MOI	L O SOIL AND ROCK DES		ELEV (ft)	DRIVE DEPTH	BLOW CO	_	BLOWS PER FO 0 25 50	OT 75 100	SAMP. NO.	/  0	SOIL AND RO	OCK DESCRIF		DEPTH (ft)
2050		<u> </u>		<del> </del>		atch Line				Tan-Orange, Fine to Coars	se Sandy CLAY	2110	+							-			
2045	2,047.	78.5	5 4	6 8	14 · · ·				w	(A-6) with Trace Rock Fragm	ients (commueu)	2105	2,103.8 3.0							ARTI TAN-BROWN, S	ND SURFACE FICIAL FILL ANDY-SILT, W OBBLES	/ EMBNK	0.0
2040	· ·	83.5	5 6	11 16	Ψ2/				w	2,041.1 Tan-Gray, Fine Sandy SILT Clay	84.4 (A-4) with Trace	2100		6 16	17	33			м	- 2,102.1 - RI - TAN-BROWN-OF	ESIDUAL		4.7
2035	,	88.5	5 13	78 22/0	0.1		100/0.6		3.5 2.5 2.5	- 2,036.5		2095	<u> </u>	1 2	4	•6 · · · · · · · · · · · · · · · · · · ·			М	2,096.7	PROLITE		10.1
2030		93.5	5 78	22/0.2						- WEATHERED R Tan-Gray (BIOTITE	ONLIGO)	2090	2,093.8 13.0	1 3	3	6	· ·   · · · · · · · · · · · · · · · · ·		м	- w/ some CRS S TR	AND & ROCK ACE MnO	FRAGS,	
		98.5	5 60/0.1					•	\$\frac{\fin}}}}}}}}}{\frac}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}	2.026.9/ CRYSTALLINE F			2,088.8 18.0	3 4	6	10			м				
		<del> </del> 								Gray (BIOTITE GI Boring Terminated wit Penetration Test Refusa 2,026.9 ft in CRYSTALLINE	h Standard I at Elevation	2085	2,083.8 23.0	3 2	3	<b>6</b> 5			M				
		Į Į								- GNEISS) - Note: - Boring filled immediately aft due to location in n	er drilling (FIAD) padway	2080	2,078.8 28.0	2 2	5	• • • • • • • • • • • • • • • • • • •		-	м				
		‡									,	2075 &	2,073.8 33.0	2 3	4	7 · · · · · · · · · · · · · · · · · · ·			M A	TAN-GRAY-ORA some CRS SAND	& ROCK FRAC	— — — — - '-SILT, w/ SS, TRACE	31.5
		<del> </del> 								-		05/01 <u>2070</u>	2,068.8 38.0	WOH 4	4	• • • • • • • • • • • • • • • • • • • •			М <sup>№</sup>	\$ <del> -</del>     	MnO		
		‡ <del>†</del>								-		DO 2065	2,063.8 43.0	3 5	6	• • • • • • • • • • • • • • • • • • • •			M	\$; <del>\</del> \$ <del>\</del> <del>\</del> \$ <del>\</del>			
		† † †								-		RELOGS.GF	2,058.8 48.0	3 4	8				N 1	7; <del> -</del> 7; <del> -</del> 7; -			
		‡ ‡								-		08 2055 2055	2,053.8 53.0			12			M N N N N N N N N N N N N N N N N N N N	₽.F 			
		† † †								-		232 HEND 2050	2,048.8 58.0	2   6	/				M 1	Ñ <del>-</del> ₩- ₩- ₩- ₩-			
		Ī										09 2045		2 5	9	14			M N 1	7. [ 			
		† †								Ė		0 4400C BB 2040	2,043.8 63.0	4 6	5	· · · · · · · · · · · · · · · · · · ·			M	;  -  -  - 	PROLITE -		<u>65</u> .8
		Ī										P 2035	2,038.8 68.0	4 6	11	17			м	TAN-BROWN, CL ROCK FRAGMEN	AY-FINE SANI		
		† †										DOOT BORE	2,033.8 73.0	10 15	12	27			м	<u>-</u> - -			



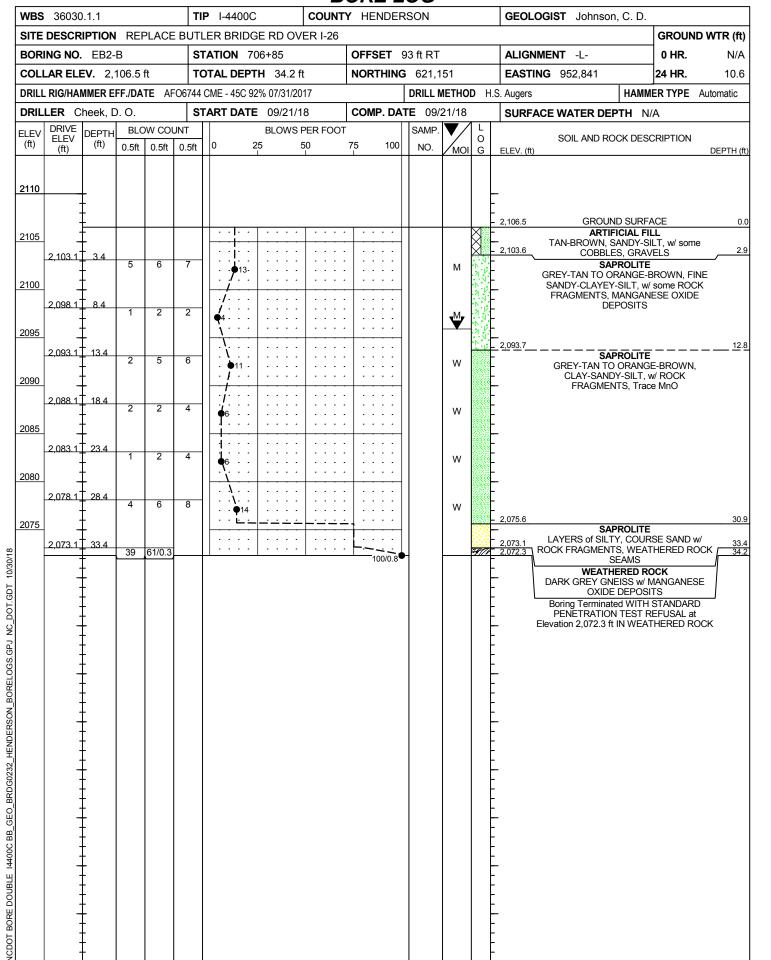
								OKL L					
WBS	36030	.1.1			TI	P I-4400C	COUNT	Y HENDER	SON			GEOLOGIST M. Arnold	
SITE	DESCR	IPTION	I-26	from I	US 25	Business (Exit	44) to near NC	280 (Exit 40	)				GROUND WTR (ft)
BORI	NG NO.	EB2-	A (B-	17)	S	TATION 708+	52	OFFSET 1	21 ft R	Γ		ALIGNMENT -L-	<b>0 HR.</b> 79.4
COLL	AR ELE	<b>V.</b> 2.1	105.3	ft	Т	OTAL DEPTH	88.9 ft	NORTHING	621.3	06		<b>EASTING</b> 952,787	<b>24 HR.</b> 22.6
						CME-55 80% 02					п н с	<u> </u>	ER TYPE Automatic
			אטו. ו	IL 10				COMP DAT			<b>U</b> 11.0		
DKIL	LER D	. Alelio				TART DATE 0		COMP. DAT		13/1/	1	SURFACE WATER DEPTH N//	4
ELEV (ft)	DRIVE ELEV	DEPTH (ft)		W COL			LOWS PER FOOT	75 400	SAMP.	▼/	Ö	SOIL AND ROCK DESC	RIPTION
(11)	(ft)	(11)	0.5ft	0.5ft	0.5ft	0 25	50	75 100	NO.	/MOI	G	ELEV. (ft)	DEPTH (ft)
2110												_	
	-	-									F		
	_	-											
2105	2,105.3	0.0	1	4	8						-	2,105.3 GROUND SURFA	
	-	-	'		0	12				M		ROADWAY EMBANK 2,103.3 Tan-Brown, Fine Sandy SIL	T (A-4) with2.0
	2,101.8	3.5	3	4	5	:;:: :						Trace Gravel and Asphalt  RESIDUAL	Fragments
2100			3	+	5	9	· · ·   · · · · ·		SS-239	23%		<ul> <li>Orange-Brown, Silty CLAY (A-</li> </ul>	7-5) with Trace
	_	-				:i: : :   :						Manganese Deposits and Fi	ne to Coarse
	2,096.8-	8.5	1	4	3					١,,	<b>F</b>	Orange-Tan, Clayey SI	LT (A-5)
2095			'			7				M		-	
	_	t l				: : :   :					於上		
ŀ	2,091.8-	- 13.5	1	1	3					١,,,	<u> </u>		
2090		-	·			•		<u> </u>		W	14	-	
	_										<u> </u>	2,088.3 Orange-Tan, Fine to Coarse	
	2,086.8-	- 18.5	2	2	2				SS-241	37%	-	(A-4) with Trace Rock Frag	gments and
2085	-	-			_	<b>●</b> 4 · · · · · ·		<del>   </del>	33-241	31%	F	Manganese Deposits, S	ome Clay
	_	-											
	2,081.8-	- 23.5	1	2	2					w	l E		
2080	_	-				<b>Q</b> 4 · · · · · ·				**	F	-	
	_					:::: :					l t		
	2,076.8-	- 28.5	2	2	3	1:::: :		: : : :		w	<b>#</b>		
2075	_	-				1		+		**	<b>-</b>	-	
	1										1		
	2,071.8-	- 33.5 -	1	2	3					w			
2070	-	- 1						+				-	
		[ <u> </u>									F		
0005	2,066.8-	- 38.5 -	3	3	4	7				w			
2065	_	-					<del>  </del>	<del>   </del>				-	
	2.064.9	42.5									-		
2060	_2,061.8- -	- 43.5 -	3	4	4	8				w			
2060	-	<u> </u>						<del>   </del>				-	
	- 2,056.8-	- - 48.5				$   \frac{1}{l} \cdot \cdot \cdot \cdot    \cdot  $					<b>                                     </b>		
2055	ح,v.v.o - -	0.0	1	1	2					w	F		
2000		<u> </u>				1   .	::: ::::					-	
	- 2.051.8-	- - 53.5				[[ ]; : : : [ -:	::: ::::						
2050	_,	-	3	3	6	. 🍎 9   .				w	<b>F</b>		
	-	Γ				\.   .		1			F	-	
	- 2.046.8-	- - 58.5				: : : \							
2045	-	- 1	7	9	14	23				w	<b>  </b>	_	
-		-				.					F	•	
	- 2,041.8-	- - 63.5				::::j :							
2040	-	<u> </u>	5	8	12	20	· · ·   · · · ·	<u> </u>		w	<b>  -</b>	_	
	-	-									F		67.0
	- 2,036.8-	- - 68.5				::::\:					17.	Pink-Orange-Tan, Clayey SI	LT (A-5) with
2035	-	<u> </u>	5	10	17	27				w	<u> </u>	Trace Rock Fragments and Deposits	ivianganese
	-	-									135F	·	
	2,031.8-	- - 73.5				:::::/ :							
2030		<u> </u>	6	8	13					W			

WBS	3603	0.1.1			ТІ	<b>P</b> I-44000		COUNT	Y HENDEF	RSON			GEOLOGIST M. Arnold		
SITE	DESC	RIPTION	I I-26	from	US 25	Business	(Exit 44) to	near NC	280 (Exit 40	))				GROUN	ND WTR (ft)
3OR	ING NO	. EB2-	A (B-	17)	S	TATION 7	08+52		OFFSET	121 ft R	Γ		ALIGNMENT -L-	0 HR.	79.4
COL	LAR EL	<b>EV.</b> 2,	105.3	ft	TO	OTAL DEP	<b>TH</b> 88.9 f	ft	NORTHING	621,3	06		<b>EASTING</b> 952,787	24 HR.	22.6
RILI	L RIG/HA	MMER E	FF./DA	TE F8	R5785	CME-55 80	% 02/11/201	17		DRILL N	ЛЕТНО	D H.S	S. Augers F	IAMMER TYPE	Automatic
RIL	LER [	). Aiello			S	TART DAT	E 07/13/1	17	COMP. DA	TE 07/	13/17		SURFACE WATER DEPTH	H N/A	
LEV (ft)	DDI\/E			0.5ft			BLOWS	PER FOOT 50	L	SAMP.	MOI	LO	SOIL AND ROCK		
2030	2,026.8	83.5	5 10 100/0.4	6 26	15 59		Mato	ch Line	85 100/0.4		W		2,028.3 Orange-Gray-Brown, STrace Rock  2,023.3 Orange-Gray-Brown, SILT (  2,018.3  2,016.4 Tan-Orange (BIC Boring Terminated at E WEATHERED ROCK  0.0'-0.1'=SURFICIAL	Fragments  Fine to Coarse S (A-4)  ED ROCK DTITE GNEISS) Elevation 2,016.4 (BIOTITE GNEI	82 87 88 9 ft in SS)

# GEOTECHNICAL BORING REPORT

SHEET 11

								B	<u>ORE L</u>	<u>OG</u>							
WBS	3603	0.1.1			TI	<b>P</b> I-4400C		COUNT	Y HENDER	RSON			GEOLOGI	ST Johnson	n, C. D.		
SITE	DESCF	RIPTION	I REI	PLACE	BUTI	LER BRIDGI	E RD OVE	R I-26								GROUN	D WTR (ft)
BOR	ING NO	. EB2-	·C		S	TATION 70	7+60		OFFSET 5	59 ft RT			ALIGNME	NT -L-		0 HR.	N/A
COL	LAR EL	<b>EV.</b> 2,	105.7	ft	TO	OTAL DEPTI	<b>4</b> 57.9 ft		NORTHING	621,1	97		EASTING	952,777		24 HR.	15.2
DRIL	L RIG/HA	MMER E	FF./DA	TE A	FO6744	CME - 45C 92°	% 07/31/201	7		DRILL N	IETHO	<b>D</b> H.S	S. Augers		HAMM	ER TYPE	Automatic
DRIL	LER (	Cheek, [	D. O.		S	TART DATE	09/24/18	3	COMP. DA	TE 09/2	24/18		SURFACE	WATER DE	PTH N	A	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	O.5ft	0.5ft	UNT 0.5ft	0 25	BLOWS P		75 100	SAMP. NO.	MOI	L O G	ELEV. (ft)	SOIL AND RO	OCK DESC	CRIPTION	DEPTH (ft)
2110		+											-				
2105		<del> </del>										- - - -	2,105.7	GROU!	ND SURFA		0.0
	2,103.7	2.0	2	2	3	5° · ·					М		SAN 2,100.6	BROWN, D-CLAYEY-SIL M			ANIC 5.1
2100	2,098.7	7.0	2	2	3	1					М	7.3	2,099.0	RE TAN-GREY ANDY-SILT-CL			6.7
2095	2,093.7	12.0										1				RANGE,	CK
2090	-	‡ ‡	2	2	3	\$5°					W	7. 2. 7. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.			AGMENTS		CK
2005	2,088.7	+ 17.0 +	1	1	2	•3 · · · ·					W	7. 2. 1 2. 2. 1 2. 2. 1	2,086.7	<u>_</u>	PROLITE		19.0_
2085	2,083.7	22.0	2	1	3	•4 · · ·					w			AN-ORANGE-F COURSE SAI RAGMENTS, TI CLAY (A6)	NDY-SILT, ace MnO:	w/ ROCK some SIL	
2080	2,078.7	27.0	1	2	3	1					w		-	0211 (10)	notou une	agnout	
2075	2.073.7	+ + - 32.0											-				
2070	,	+	1	3	2	5					W		_				
	2,068.7	37.0	3	5	6	11 .					W						
2065	2,063.7	42.0	4	7	9	16					М		-				
2060	2,058.7	47.0	6	8	9						M		-				
2055	2.053.7	+ + - 52.0											-				
2050		† 	10	15	19		34 .				М		- 2 040 2				56 F
	2,048.7 2,047.9	57.0 57.8	100/0.3 60/0.1	3				<del></del>	- 100/0.3 60/0.1				2,049.2 2,047.9 2,047.8/	DARK (	HERED RO GREY GNE ALLINE R	ISS DCK	56.5 57.8 57.9
2065 2060 2055 2050	-	† †												DARK O Boring Termina PENETRATIO ation 2,047.8 ft	N TEST R	STANDAR EFUSAL at	t
	-	<del> </del> 											-				
	-	‡ ‡											-				
		Ŧ															



REFERENCE

36030

# STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

#### **CONTENTS**

SHEET NO. **DESCRIPTION** TITLE SHEET LEGEND (SOIL & ROCK) SITE PLAN PROFILE 5-6 CROSS SECTIONS 7-10 BORE LOGS

# **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY BUNCON	MBE			
PROJECT DESCRIP	TION REPLAC	E BRIDGE	0008 ON	<u>-Y1</u> 2-
(FANNING BRI				
SITE DESCRIPTION				

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
I.C.	I4400-C	1	10

#### **CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1(99) 707-650. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS, THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD, THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATION ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS HOLD THE SUBSURFACE INVESTIGATION ARE AS RECORDED AT THE CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

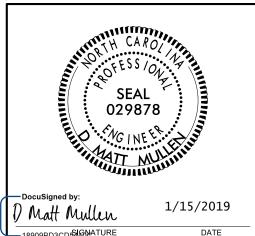
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE TO MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISTY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:

  1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.

  2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

	M. ARNOLD
	N. CONSIGLI
	D. AIELLO
	C. BOYCE
INVESTIGATED	BYDMMULLEN
DRAWN BY <u>D</u>	M MULLEN
CHECKED BY _	JC KUHNE
	JC KUHNE
DATE	



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DOCUMENT NOT CONSIDERED FINAL **UNLESS ALL SIGNATURES COMPLETED** 

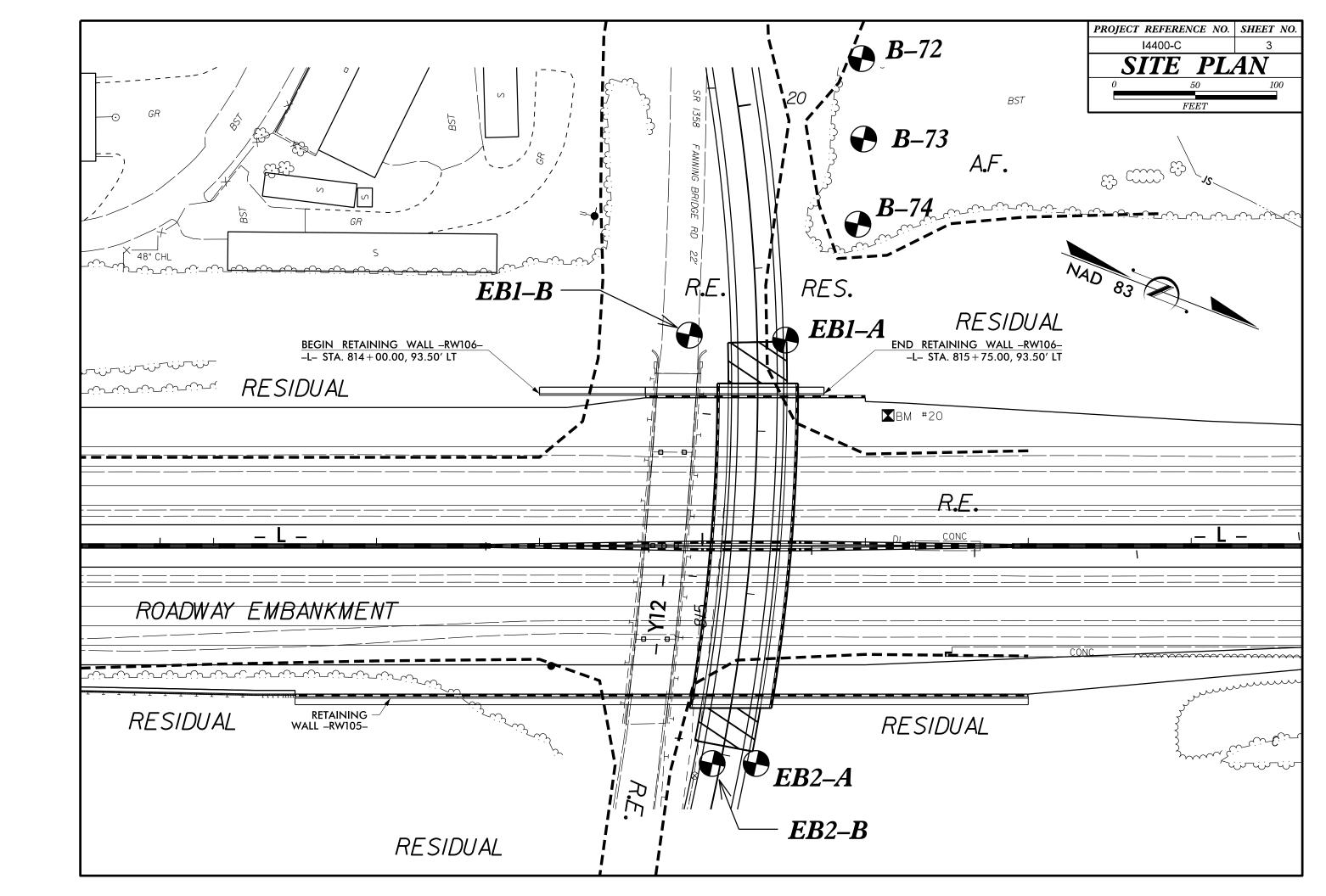
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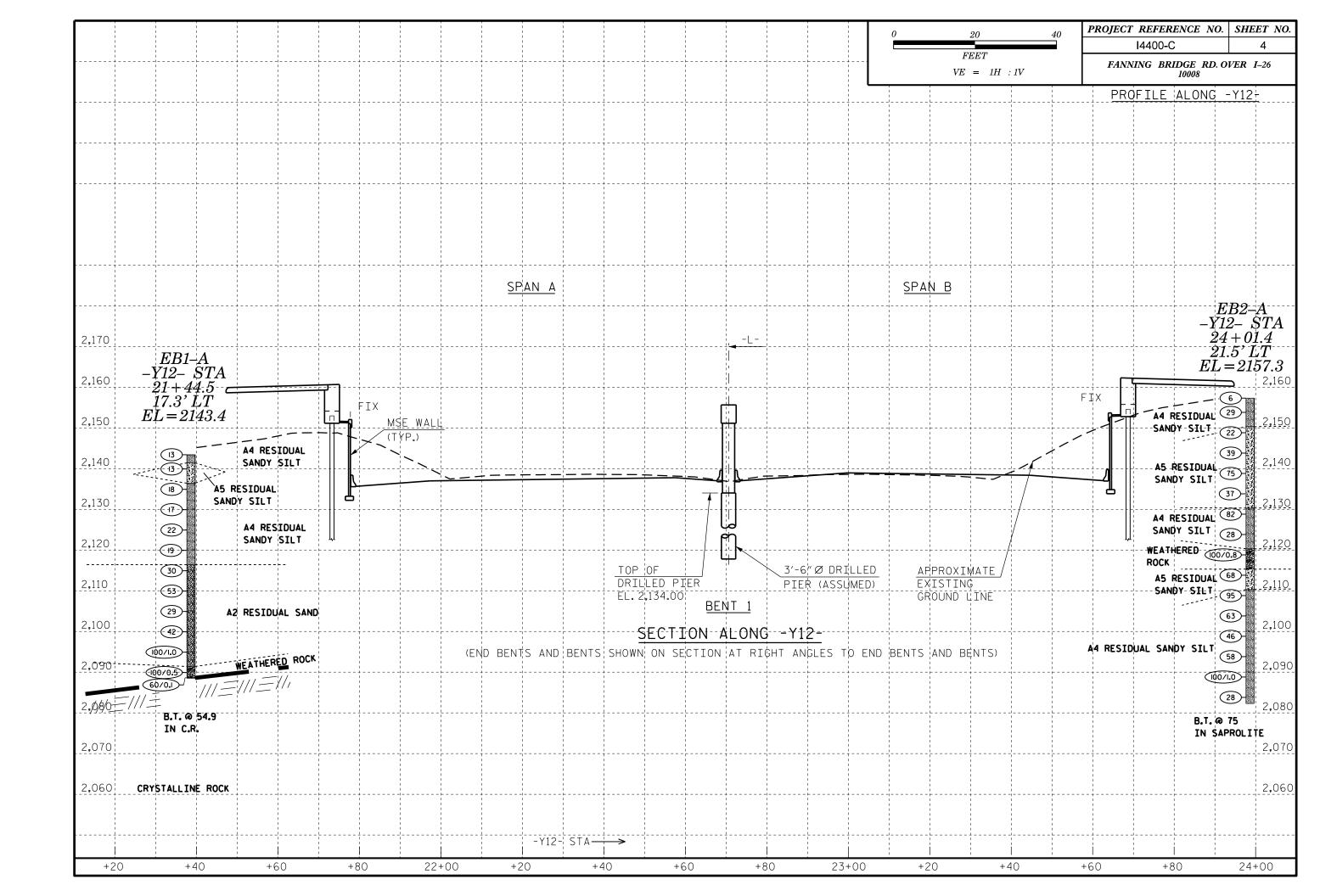
# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

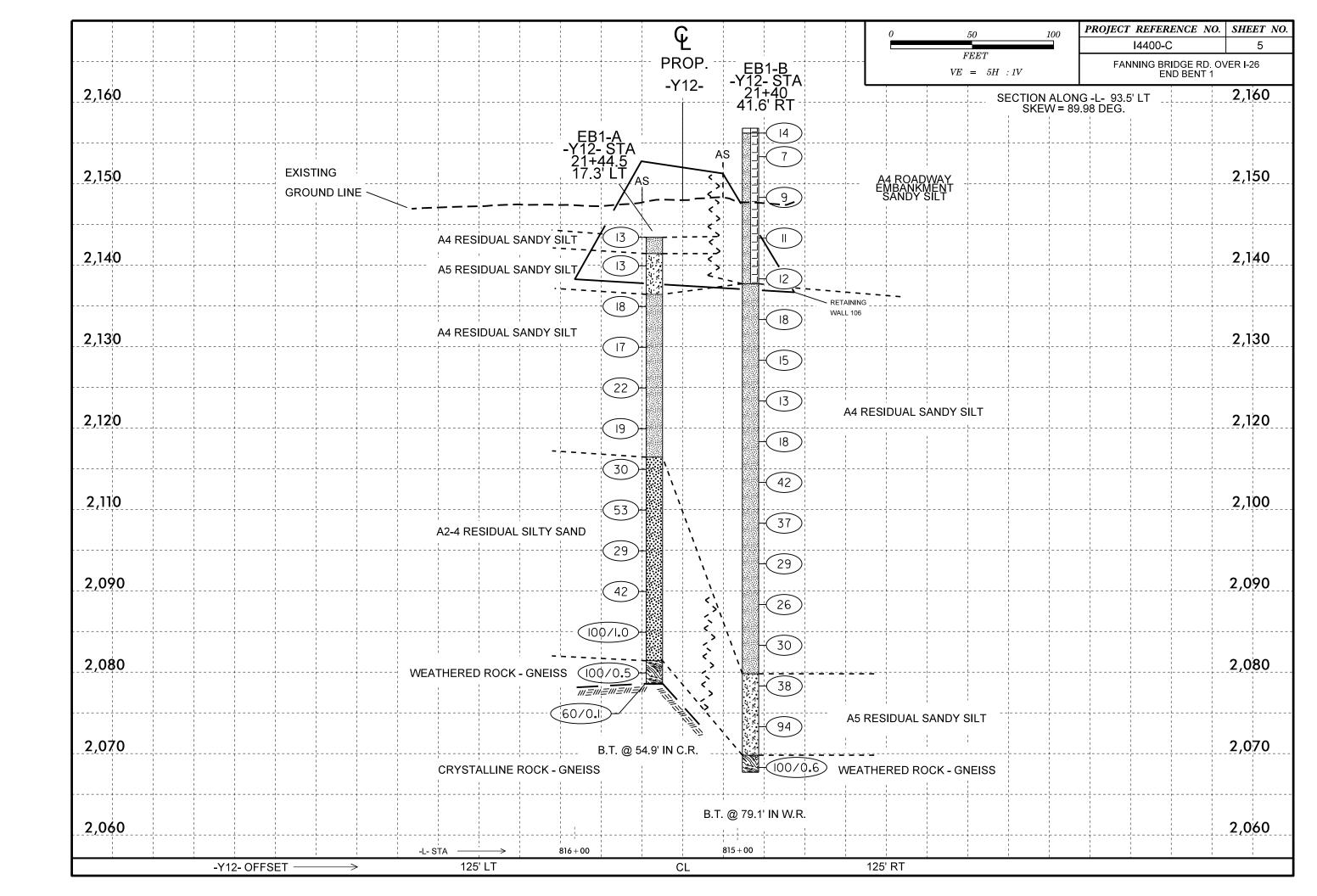
# SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
VERY STIFF,GRAY,SILTY CLAY,MOIST WITH INTERBEDDED FINE SAND LAYERS,HIGHLY PLASTIC,A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS CLASS, (≤ 35% PASSING *200) CRGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, CRYSTALLINE ROCK (CR)	SURFACE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	UNEISS, CHEBRO, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-5 A-3 A-6, A-7	COMPRESSIBILITY	BOOK (NICE) SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.  COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.
7. PASSING	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
"10 50 MX GRANULAR SILI- MUCK,	PERCENTAGE OF MATERIAL	CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*40 30 MX 50 MX 51 MN PEAT SOILS SOILS PEAT SOILS SOIL	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3%, 3 - 5%, TRACE 1 - 10%	HAMMER IF CRYSTALLINE.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 SOILS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
LL   -   -   40 MX   41 MN   40 MX   41 MN   40 MX   41 MN   40 MX   41 MN   LITTLE OR HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
CROLIP INDEX A A A AMY S MY 12 MY 16 MY NO MY AMOLINTS OF ORGANIC	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
USUAL TYPES STONE FRACS ORGANIC SUILS	✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL, AND FINE SILIT OF CLATET SILIT CLATET MATTER	STATIC WATER LEVEL AFTER 24 HOURS	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SANU	✓ PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR UNSUITABL		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
P1 OF A-7-5 SUBGROUP IS ≤ LL - 30 ; P1 OF A-7-6 SUBGROUP IS > LL - 30	— O-M► SPRING OR SEEP	WITH FRESH ROCK.	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED	TT 25,425	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (N-VALUE) (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE)  25/02/5  DIP & DIP DIRECTION  WITH SOIL DESCRIPTION  OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE ( 4	SPT C SLODE INDICATOR	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT.
GRANII AP LOOSE 4 TO 10	SOIL SYMBOL  OPT DAT TEST BORING  INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
MATERIAL MEDIUM DENSE 10/10/30/ N/A	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT AUGER BORING TEST	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF  VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THAN ROADWAY EMBANKMENT THOUGH BURNING TEST	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	── INFERRED SOIL BOUNDARY ————————————————————————————————————	(V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY   SOFT   2 TO 4   0.25 TO 0.5     SILT-CLAY   MEDIUM STIFF   4 TO 8   0.5 TO 1.0	INFERRED ROCK LINE MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	WITH CORE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	→ SPT N-VALUE  TINSTALLATION  SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	TO LING ACCIDID EVANATION - FEST LING ACCIDID EVANATION -	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	ROCK.  SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNSUITABLE WASTE  ACCEPTABLE, BUT NOT TO BE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY  MOD MODERATELY  7 - UNIT WEIGHT  CPT - CONE PENETRATION TEST  NP - NON PLASTIC  7 - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOLI MOISTURE SCALE FIELD MOISTURE	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS)  DESCRIPTION  GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC PLASTIC SEMISOLID; REQUIRES DRYING TO	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK: BM 20
(PI) PL PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS  VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	
OM OPTIMUM MOISTURE - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 2067.91 FEET
SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:  CME-45C CLAY BITS X AUTOMATIC MANUAL	MODERATELY CLOSE	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO		VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
ATTAIN OPTIMUM MOISTURE	CME-55 6° CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	
PLASTICITY	X 8* HOLLOW AUGERS	INDURATION	
PLASTICITY INDEX (PI) DRY STRENGTH	X CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
	TUNG,-CARBIDE INSERTS	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
NON PLASTIC 0-5 VERY LOW			
	VANE SHEAR TEST CASING WY ADVANCER HAND TOOLS:	CRAING CAN DE CERARATER ERON CAMPLE MITH CIEFL PROPE	
NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST CASING W/ ADVANCER HAND TOOLS:  DOOLAGE VOICE STEEL TEST	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST CASING W/ ADVANCER HAND TOOLS:  PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MODERATELY INDURATED  GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.  GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
NON PLASTIC         0-5         VERY LOW           SLIGHTLY PLASTIC         6-15         SLIGHT           MODERATELY PLASTIC         16-25         MEDIUM           HIGHLY PLASTIC         26 OR MORE         HIGH           COLOR	VANE SHEAR TEST CASING W/ ADVANCER HAND TOOLS:  PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER  TRICONE TRUGO-CARB. SOUNDING ROD	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
NON PLASTIC         0-5         VERY LOW           SLIGHTLY PLASTIC         6-15         SLIGHT           MODERATELY PLASTIC         16-25         MEDIUM           HIGHLY PLASTIC         26 OR MORE         HIGH	VANE SHEAR TEST CASING W/ ADVANCER HAND TOOLS:  PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MODERATELY INDURATED  GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.  GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	DATE: 8-15-1







		PROJECT REFERENCE NO. SHEET NO. 14400-C 6  FEET  VE = 5H : 1V  SECTION ALONG -L- 93.5' RT  SKEW = 80.46 DEG.  PROJECT REFERENCE NO. SHEET NO. 14400-C 6  FANNING BRIDGE RD. OVER 1-26  EB2
	PROPOSED Y-12	PRELIMINARY RETAINING WALL ENVELOPE APPROXIMATE WALL FACE AREA = 4,740 SF
2,170 2,160 2,150	$EB2-A \ AS \qquad EB2-B \ AS$ $SILTY CLAY$ $EB2-A \ AS \qquad EB2-B \ AS$ $EB2-B \ AS \qquad EB2-B \ AS$ $EB2-B \ AS \qquad EB2-B \ AS \qquad EB2$	2,15
2,140	A5 RESIDUAL SANDY SILT T5  B  A4 RESIDUAL  37  B  PROP GRADE  WEATHERED ROCK TOOLOG B  28  A4 RESIDUAL  26  A4 RESIDUAL  25  A4 RESIDUAL  26  A4 RESIDUAL  27  A4 RESIDUAL  28	
2,110	A4 RESIDUAL SANDY SILT  A5 RESIDUAL SANDY SILT  SANDY SILT  63 A5 RESIDUAL  5 A5 RESIDUAL SANDY SILT	2,11
_2,090	NOTE: THE WALL ENVELOPE DOES NOT ACCURATELY  DEPICT THE ACTUAL FACE OF WALL.  B.T. Q. 70 IN SAPROLITE  1 N SAPROLITE	2,0
2,060	-Y12- OFFSET→ 200 LT 100 LT 100 RT 200 RT	300 RT 2,0
	-L- STA→ 817+00 816+00 815+00 814+00 813+00	812+00

									UKE L	.00				
WBS	34232	.1.FS4			TI	P I-4400C	;	COUNTY	/ HENDER	SON			GEOLOGIST N. Consigli	
SITE	DESCR	IPTION	I-26	from U	IS 25 E	Business (E	xit 44) to ne	ear NC 28	0 (Exit 40)					GROUND WTR (ft)
BOR	ING NO.	B-67	(EB1- <i>F</i>	<del>)</del>	Sī	TATION 8	15+51		OFFSET	132 ft L1	Γ		ALIGNMENT -L1-	<b>0 HR.</b> 30.5
COL	LAR ELE	<b>EV.</b> 2,	143.4 f	ft	Т	OTAL DEPT	<b>ΓH</b> 54.9 ft		NORTHING	630,9	72		<b>EASTING</b> 948,355	<b>24 HR.</b> 27.8
DRILL	RIG/HAN	IMER EF	F./DATI	F F&R	3763 C	ME-550X 86%	6 1/30/2017			DRILL	/IETHOD	) HS	i. Augers HAMM	ER TYPE Automatic
	LER C					TART DATE		7	COMP. DA				SURFACE WATER DEPTH N/A	
	DDIVE	DEPTH	BLC	W COI				PER FOOT		SAMP.		1 L T	GOITA NOT THE TOTAL THE TANK	
ELEV (ft)	ELEV (ft)	(ft)	0.5ft			0 2			75 100	NO.	MOI	O G	SOIL AND ROCK DESC	CRIPTION DEPTH (ft)
	(1.0)										VIVIOI	H	ELEV. (II)	DEF IH (II)
2145		<u> </u>										ΙĿ		ACE 0.0
	2,143.4	0.0	7	7	6	13					М		RESIDUAL	
2140	2,139.9	35						: : : :				7.7	_2,141.4 Brown, Fine Sandy SILT (A Mica, Rock Fragments, a	-4) with Trace2.0 nd Organics
	- 2,139.9	3.5	4	6	7	· ·•13·					М	11	Brown, Clayey SILT (A-5) w	
Ī	-	ļ				/							2,136.4 and Rock Fragme	ents 7.0
2135	2,134.9 <u></u>	8.5			10	1 .							Light Brown, Fine Sandy S Trace Mica and Mangane	ILT (A-4) with
	-	<u> </u>	8	8	10	18	3				M		Trace Wilea and Wangane	.sc Deposits
	-	ŧ				.	: : : :				1	<b>#</b>		
2130	2,129.9	13.5	6	8	9			ļ			M	₽ F	-	
	-	F				1		: : : :			"	F		
2125	2,124.9	40.5						: : : :				F		
2120	2,124.9	18.5	6	10	12		122				М	F	-	
	-	‡				: : : ;								
2120	2,119.9 <u>-</u>	23.5										<u> </u>	_	
	-	-	8	8	11	• • 1	9				W	H		
	-	<u> </u>				: : : :\						<u> </u>	2,116.4	27.0
2115	2,114.9	28.5	7	10	20		<u> </u>				_	_	Light Brown to Gray, Silty (A-2-4) with Trace Mica an	
	-	ļ	′		20		30				W		Deposits	-
0440	-	<u> </u>												
2110	2,109.9	33.5	24	22	31			53			l w		-	
	-	<u> </u>					:::::							
2105	2,104.9	38.5					/					_		
	-,101.0	- 00.0	10	14	15		€29				W	_		
	-	ļ					\.\.					_		
2100	2,099.9	43.5	28	24	18		/				l	_	_	
	-	‡	20	24	10		• • • • • • • • • • • • • • • • • • • •				l w	_		
000-	-	‡						:```	.[::::		1			
2095	2,094.9	48.5	32	52	48			: : : :			1		_	
	-	<u> </u>							100/1.0		1	-	2 001 4	50.0
2090	2.089.9	53.5						<u> </u>			1			
	2,088.6		100/0.5						- 100/0.5			9/1	Gray (BIOTITE GN	54.8
	-	ļ	60/0.1						60/0.1			}	_2,088.5 CRYSTALLINE R Gray (BIOTITE GN	
	-	<u> </u>											Boring Terminated with	Standard
		‡									1		Penetration Test Refusal 2,088.5 ft in CRYSTALL	INE ROCK
	-	<u> </u>										<u> </u>	(BIOTITE GNEIS	oo)
	-	ŀ									1	<u> </u>	_ Note: 1) 0.0'-0.1'=SURFICIAL OR	
	-	-									1	F	2) Auger Refusal a	
	-	Į.									1			
	-	ļ											-	
	-	‡												
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53.2

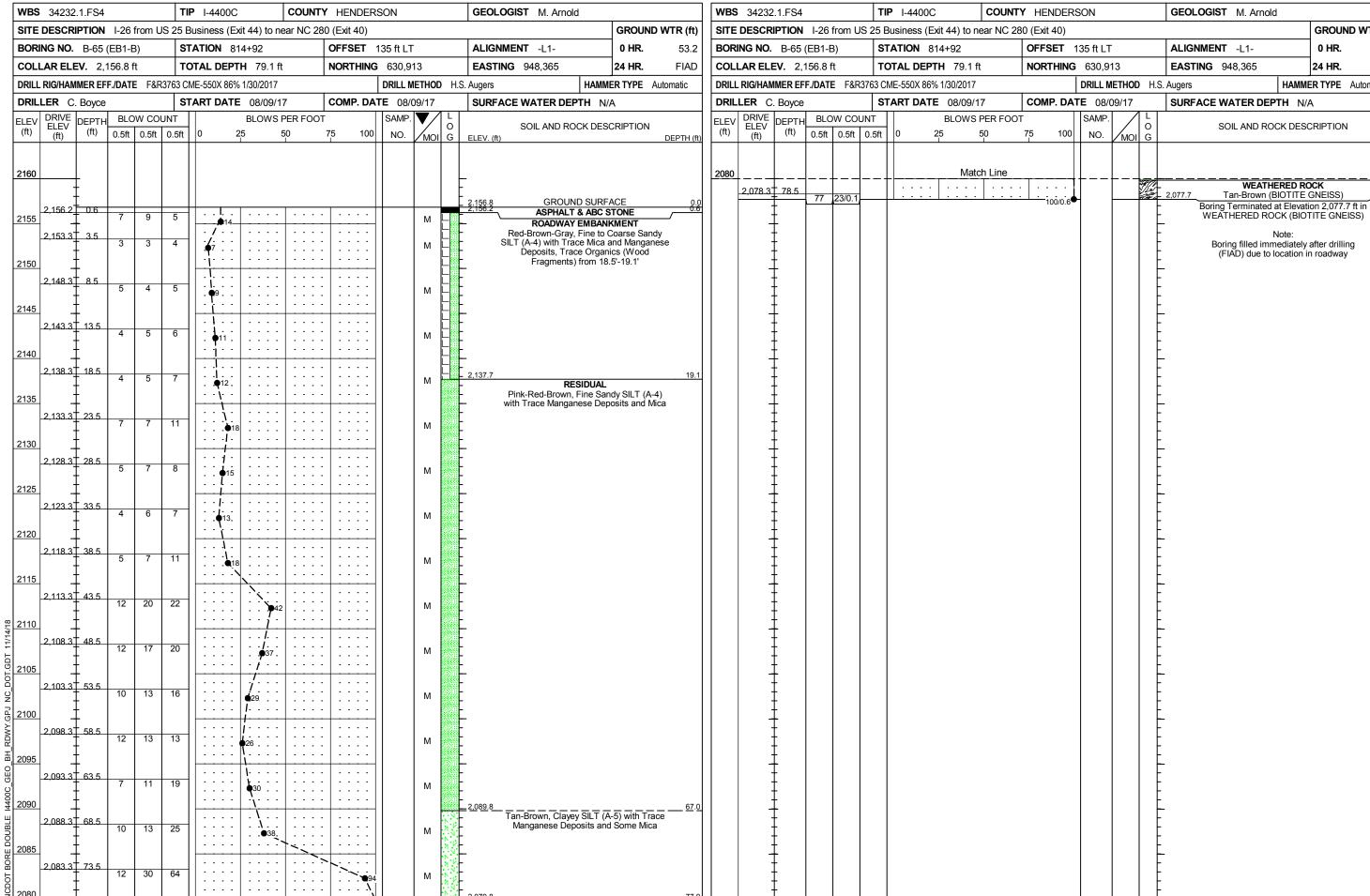
FIAD

**GROUND WTR (ft)** 

0 HR.

24 HR.

HAMMER TYPE Automatic



50.1

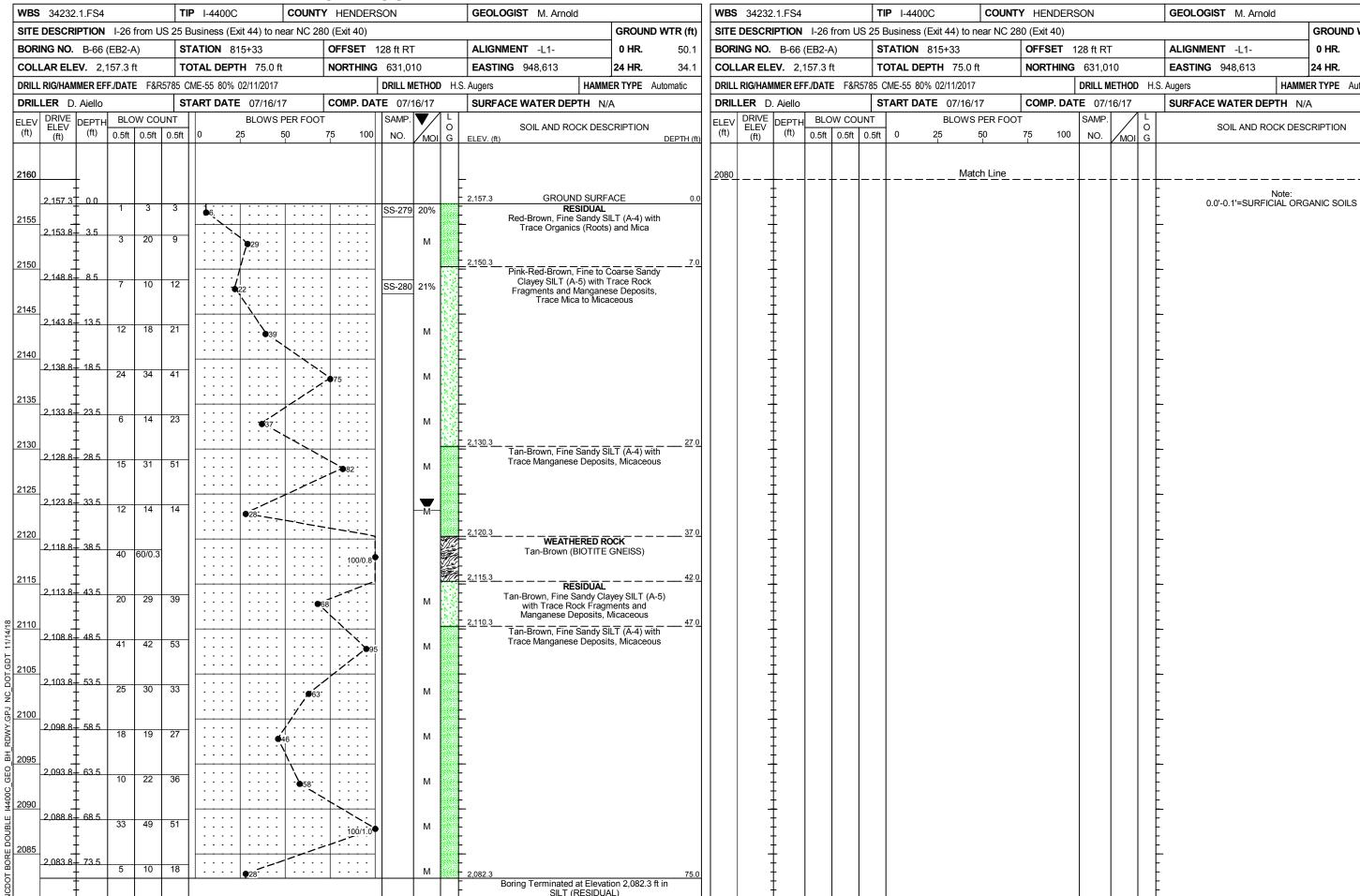
34.1

**GROUND WTR (ft)** 

0 HR.

24 HR.

HAMMER TYPE Automatic



							<u>_</u>	UKE L	<u> </u>				
WBS	34232	2.1.FS4			TI	P I-4400C	COUNT	Y HENDER	SON			GEOLOGIST M. Arnold	
SITE	DESCR	IPTION	I-26	from L	JS 25 E	Business (Exit 44) to	near NC 28	80 (Exit 40)					GROUND WTR (ft)
BOR	ING NO.	B-64	(EB2-I	3)	ST	<b>FATION</b> 815+06		OFFSET	128 ft RT	-		ALIGNMENT -L1-	<b>0 HR.</b> Dry
COL	LAR ELI	<b>EV.</b> 2,	158.0	ft	TO	OTAL DEPTH 70.0	ft	NORTHING	630,98	34		<b>EASTING</b> 948,619	<b>24 HR.</b> 33.2
DRILL	RIG/HAN	MER EF	F./DAT	E F&F	R5785 C	ME-55 80% 02/11/20°	7		DRILL M	ETHOD	) H.S	. Augers HAMMI	ER TYPE Automatic
DRIL	. <b>LER</b> D	. Aiello			ST	TART DATE 07/16	/17	COMP. DA	TE 07/	16/17		SURFACE WATER DEPTH N/	A
ELEV	DRIVE	DEPTH	BLC	ow co	UNT	BLOW	S PER FOOT	Γ	SAMP.	<b>V</b> /	L	OO! AND DOOK DEGG	ODIDION
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	50	75 100	NO.	МОІ	O G	SOIL AND ROCK DESC	DEPTH (ft)
2160													
2.00	2.158.0	0.0									-	- 2,158.0 GROUND SURFA	ACE 0.0
	2,130.0	- 0.0	1	2	3	5				М	F	RESIDUAL	
2155	2.154.5	3.5				1						Red-Brown, Fine Sandy SI Trace Organics (Roots), M	ica, and Rock
	-,101.0	1	3	2	6	. <del>/</del> 8		.		М	<u>+</u>	2,153.5 Fragments  Red-Brown, Silty CLAY (A-	.7) with Trace
		t					-	.				2.151.0 Mica and Rock Frag	ments 7.0
2150	2,149.5	8.5	8	9	12					١	H	Pink-Red-Brown, Fine San with Trace Managense Dep	dy SILT (A-4) osits and Mica
		Ŧ	ľ	9	12	21				M	F		
2145		Ŧ				::::\\::::					F		
	2,144.5	13.5	13	12	16					М	F	-	
		‡											
2140	2.139.5	185					· · · · ·					-	
	2,100.0	10.0	10	12	16	28		.		М	₩t		
		ł				/	-	.			F		
2135	2,134.5	23.5	<u> </u>					+			F	-	
		‡	7	8	11	<b>1</b> 9				M	<b>F</b>		
2420		‡										2,131.0	27.0
2130	2,129.5	28.5	6	9	11					M	N L	Orange-Brown, Clayey Fin (A-5) with Trace Manganese	e Sandy SIL I e Deposits and
		ŧ			''	$\begin{vmatrix} & & & & & & & & & & & & & & & & & & &$		:   : : : :		IVI		Mica	
2125		<del> </del>					-	.			7	2,126.0 Red-Brown and Tan-Gray	32.0 -Brown, Fine
	2,124.5	33.5	6	10	15	25				М	F	Sandy SILT (A-4) with Trac Deposits, Rock Fragments,	e Manganese,
		Ŧ					.				F	Micaceous	Trace Ivilica to
2120	2,119.5	38.5										-	
		‡	8	11	12	23				М			
		ţ					-	.					
2115	2,114.5	43.5	8	14	14	\ <del>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</del>	+	+		١	l E	-	
		ŀ	ľ	14	'*	· · · ·   •28. ·		.		M	F		
2110		Ŧ				::::  ;::	.				F		
2110	2,109.5	+ 48.5 +	13	17	17					М	F	-	
	] :	‡				· · · ·   · <del>/</del> .34						2 106 0	50.0
2100	2.104.5	53.5				/					, , , <u>, , , , , , , , , , , , , , , , </u>		
	-,107.5	1	10	13	13	26	.	:		М		with Trace Manganese Micaceous	Deposits,
		ŧ				:::: ::>	<u> </u>	.					
2100	2,099.5	58.5		10	60		+	+				-	
	:	Ŧ	8	12	68			₩80		М	0000	2,098.4 Tan-Brown, Fine to Coarse	
2095		‡						: : : ;;   :			ŏŏŏ	2,096.0 with Trace Rock Fra	gments 62.0
2030	2,094.5	63.5	12	29	55			· <b>. .</b>		M		Tan-Brown, Fine Sandy SI Trace Manganese Depos	its and Rock
		‡	-					84 .		IVI	肚	Fragments, Micac	eous
2090	2,000 5	1									H	_	
	2,089.5	68.5	14	19	24		<b>1</b> 43			М	<b>F</b>	2,088.0	70.0
		ļ				· · · · · · · · · · · · · · · · · · ·			1		-	Boring Terminated at Elevati SILT (RESIDUA	ion 2,088.0 ft in
	_	‡										· -	nL)
	:	‡										Note: 0.0'-0.1'=SURFICIAL ORG	SANIC SOILS
		ŧ									<u> </u>		
1	1	1		1									

SHEET

10

B 4400C REFERENCE

B

**CONTENTS** 

**DESCRIPTION** 

ORIGINAL INVENTORY, 2/2001

ADDTL BORING LOGS EBI-C, EB2-C, 10/2018

TITLE SHEET

SITE PLAN

LEGEND

SHEET NO.

4, 5

6-20

36030

## STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

# **STRUCTURE** SUBSURFACE INVESTIGATION

**HENDERSON** COUNTY PROJECT DESCRIPTION I-26 FROM US 25 TO NC 280 440228 SITE DESCRIPTION BRIDGES 228 AND 230 ON I-26 OVER BLUE RIDGE SOUTHERN RAILROAD

> NOTE: BORING LOCATIONS UPDATED TO LOCATIONS ON ALIGNMENT FOR 1-4400C. SEPTEMBER. 2018 THIS INVENTORY UPDATES AND REVISES THE ORIGINAL DATED 2001, WITH ADDITIONAL BORING INFORMATION, BORINGS EBI-C AND EB2-C

STATE PROJECT REFERENCE NO. 440228 20 I-4400C

#### **CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1999 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOL. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE OR INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION, THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

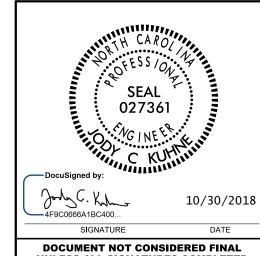
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT, FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED OF AN PREASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:

  1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.

  BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

LAW ENGINEERING B. BANKS NCDOT CD JOHNSON CJ COFFEY DO CHEEK J KUHNE INVESTIGATED BY DRAWN BY CHECKED BY SUBMITTED BY \_ J KUHNE OCTOBER, 2018



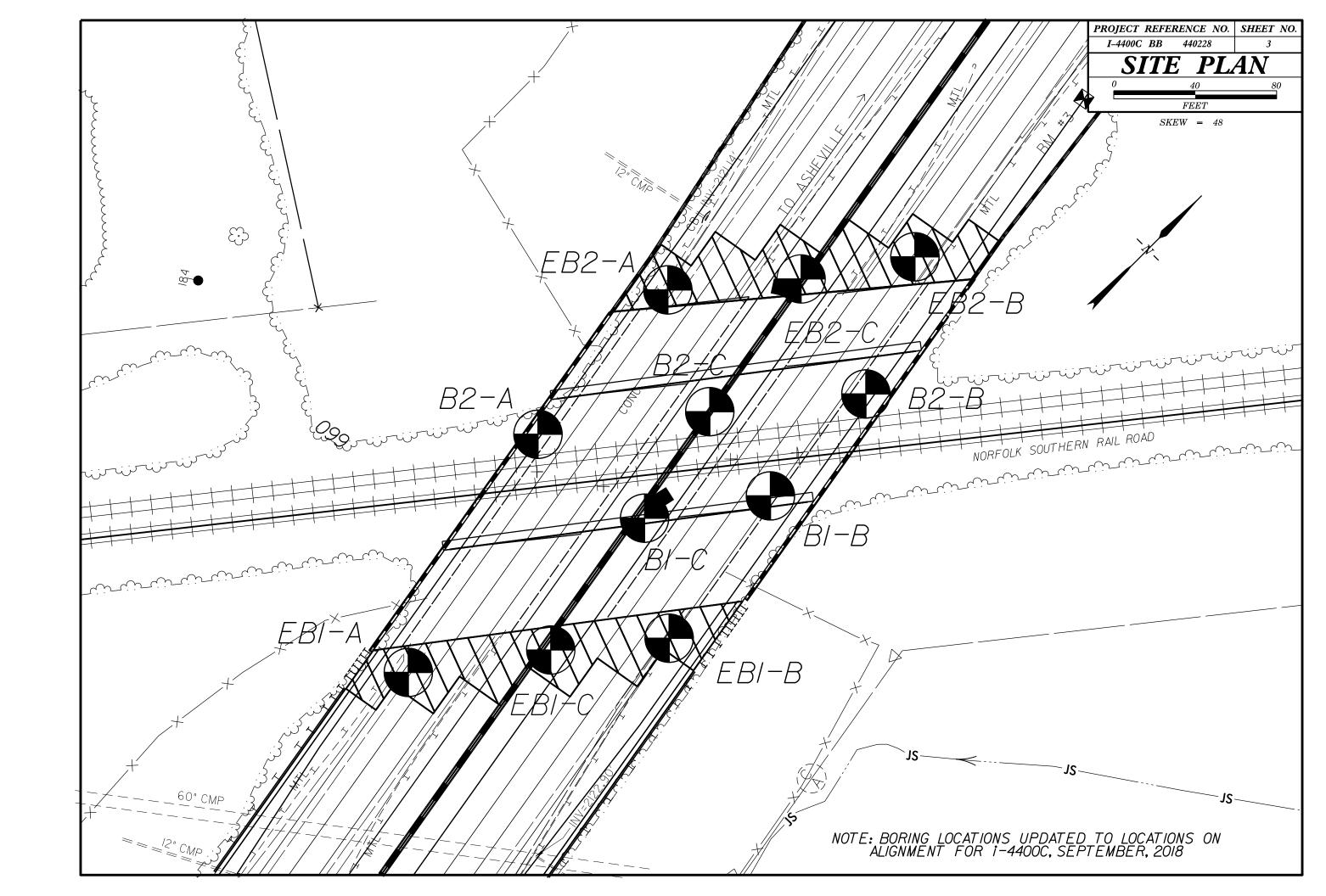
**UNLESS ALL SIGNATURES COMPLETED** 

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	<u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN	AQUIFER - A WATER BEARING FORMATION OR STRATA.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,  VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	50//60//A	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS OPERANCE MATERIALS	MINERALOGICAL COMPOSITION	CRYSTALLINE CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
LLASS. (≤ 35% PASSING *200) (> 35% PASSING *200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.  ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	SURFACE. <u>CALCAREOUS (CALC.)</u> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-6 A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-4-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOI 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	OF SLOPE.
7. PASSING	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*10 50 MX GRANULAR CLAY MUCK,	PERCENTAGE OF MATERIAL	CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*40   30 MX   50 MX   51 MN   PEAT   SOILS   SOILS   SOILS   SOILS   PEAT   SOILS   SO	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL		ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3%, 3 - 5%, TRACE 1 - 10%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING #40 SOILS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
LL 48 MX 41 MN LITTLE OR LITTLE OR HIGHLY PI 6 MX NP 18 MX 18 MX 11 MN 11 MN 18 MX 18 MX 11 MN 11 MN MODERATE HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOULS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER		(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS	lacktriangle static water level after $24$ hours	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
CEN BATING	<u> </u>	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
CONSISTENCY OR DENSENESS  RANGE OF STANDARD RANGE OF UNCONFINED	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION  WITH SOIL DESCRIPTION OF ROCK STRUCTURES	<u>IF TESTED, WOULD YIELD SPT REFUSAL</u>	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
(N-VALUE) (TONS/FT²)  VERY LOOSE < 4	SPI SPI	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT.
GRANII AR LOOSE 4 TO 10	SOIL SYMBOL  SOIL SYMBOL  SOIL SYMBOL  SUPPLINDICATOR INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF  VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THAN ROADWAY EMBANKMENT TEST	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT         < 2         < 0.25           GENERALLY         SOFT         2 TO 4         0.25 TO 0.5	— INFERRED SOIL BOUNDARY — CORE BORING SOUNDING ROD	(V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u>	OF AN INTERVENING IMPERVIOUS STRATUM,
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES,) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
MATERIAL   STIFF   8 TO 15   1 TO 2	A ALLINIAL COLL BOUNDARY A PIEZOMETER COLL SOT N. VALUE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
HARD > 30 > 4	INSTALLATION	ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE.  SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIF	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
COARSE FINE	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL SAND SAND SILT CLAY		MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
CSE. SD.)   (F SD.)   (CEI   CEI	ABBRE VIATIONS  AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	OR SLIP PLANE.  STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY  MOD MODERATELY  7 - UNIT WEIGHT  CPT - CONE PENETRATION TEST  NP - NON PLASTIC  7 - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE CHIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION OUDE FOR FIELD MOISTONE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM COUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
LL _ LIOUID LIMIT	F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.  TOPSOIL (TS,) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
PLASTIC   SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	
(PI) PL PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	BENCH MARK: -BL3-
- MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 2122.05 FEET
OM _ OPTIMUM MOISTURE SL _ SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO	CME-45C CLAY BITS AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
ATTAIN OPTIMUM MOISTURE	CME-55 CME-55 CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	
PLASTICITY	8' HOLLOW AUGERS	INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC 0-5 VERY LOW	HARD FACED FINGER BITS  -N  THIS CARRIED INSERTS	DURRING WITH FINGER ERES NUMEROUS GRAINS.	
SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST VANE SHEAR TEST HAND TOOLS:	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	CASING W/ ADVANCER POST HOLE DIGGER	MODERATELY INDURATED  GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;  BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	CRAING ARE DIFFICULT TO SEPARATE WITH STEEL PROPE.	
	TRICONE TUNGCARB. SOUNDING ROD  CORE BIT VANE SHEAR TEST	INDURATED DIFFICULT TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	<b>1</b>	SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1



**GROUND WTR (ft)** 

N/A

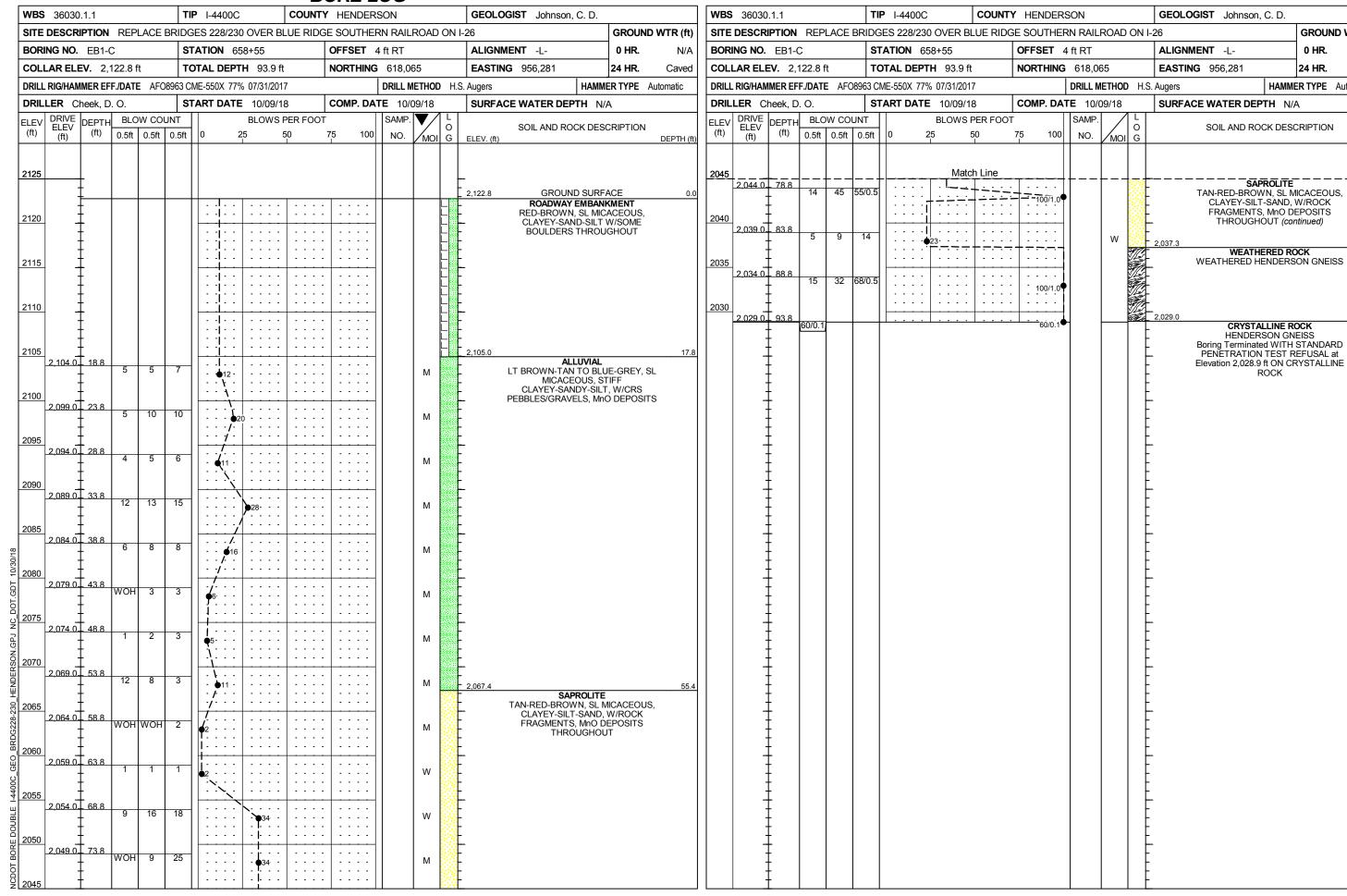
Caved

0 HR.

24 HR.

ROCK

HAMMER TYPE Automatic



							<u>D</u>	<u>ORE L</u>	UG				
WBS	36030.	.1.1			TI	IP I-4400C	COUNTY	/ HENDERS	SON			GEOLOGIST Johnson, C. D.	
SITE	DESCRI	PTION	REP	LACE	BRIDG	GES 228/230 OVER BI	UE RIDG	E SOUTHER	RN RAILI	ROAD	ON I-	26	GROUND WTR (ft
BORI	NG NO.	EB2-0	C		S	<b>TATION</b> 660+75		OFFSET 1	ft LT			ALIGNMENT -L-	0 HR. N/A
COLL	AR ELE	<b>V.</b> 2,	122.0	ft	TO	OTAL DEPTH 72.4 ft		NORTHING	618,14	16		<b>EASTING</b> 956,077	24 HR. Caved
DRILL	RIG/HAM	MER EF	F./DAT	E AFC	08963 C	ME-550X 77% 07/31/201	7		DRILL M	ETHOD	H.S.	. Augers HAMM	ER TYPE Automatic
DRIL	LER Ch	neek, D	). O.		S	TART DATE 10/25/1	8	COMP. DAT	E 10/2	25/18		SURFACE WATER DEPTH N/	A
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLC 0.5ft	0.5ft		<del> </del>	PER FOOT	75 100	SAMP. NO.	MOI	L O G	SOIL AND ROCK DES	CRIPTION DEPTH (
125	-	- - -									-	2,122.0 GROUND SURF ROADWAY EMBANI RED-BROWN, SLIGHTLY	KMENT
115	-	- - - -			NO DRIVE	1						CLAY-SAND-SILT w/COAF	
110	- - - -	- - - -			NO DRIVE							-	
105		- - - -			NO DRIVE							2,105.9	
100	2,097.9	- - - - - 24.1	3	3	NO DRIVE							- 2,097.9	24
095	2,092.9	- - - - 29.1	3	2	3	† · · · · · · · · · · · · · · · · · · ·				M		SAPROLITE ORANGE-BROWN, MIC - CLAY-SAND-SILT w/Mno S FRAGMENTS	CACEOUS, SEAMS, ROCK
090	2,087.9	- - - - - 34.1	3			ф5- · · · · · · · · · · · · · · · · · · ·				М		-	
085	2,082.9	- - - - 39.1		2	3	4				М		-	
080	2,077.9	- - - - 44.1	WOH 2	3	3	J			SS-SS-1	M M		-	
075	2,072.9	- - - - 49.1	WOH		4	1				M		-	
070	2,067.9	- - - - 54.1 -	1	2	3	1				M		-	
065	2,062.9	- - - <u>- 59.1</u> -	16	17	24					M		-	
060	2,057.9	- - - <u>- 64.1</u> -	20	18	23					M		-	
055	2,052.9	-	43	57/0.3				100/0.8				- 2,052.9 WEATHERED RO DARK GREY, WEATHERE -2,049.6 GNEISS	
	2,049.6	<u>- 72.4</u> - - -	60/0.0					60/0.0			-	CRYSTALLINE R DARK GREY BIOTITE Boring Terminated WITH PENETRATION TEST F	OCK GNEISS

WBS	36030	.1.1			TI	<b>P</b> I-4400	OC	COUNT	Y HENDER	SON			GEOLOGIST Johnson,	C. D.		
SITE	DESCR	IPTION	REP	LACE	BRIDO	GES 228/2	230 OVER I	BLUE RID	GE SOUTHER	RN RAIL	ROAD	ON			GROUN	ID WTR (ft
	NG NO.					TATION			OFFSET				ALIGNMENT -L-		0 HR.	N/A
	LAR ELE			 t	-		PTH 72.4	ft	NORTHING		46		<b>EASTING</b> 956,077		24 HR.	Cave
							7% 07/31/20		1			) H (	S. Augers	Тнуми		Automatic
	LER C			_ // (			TE 10/25/		COMP. DA			<i>,</i> 11.0	SURFACE WATER DEF			Automatic
				W CO		IAKI DA		PER FOO		SAMP.		1 L T	SURFACE WATER DEF	III N/	Α	
LEV (ft)		DEPTH (ft)		0.5ft	0.5ft	0	25	50	75 100	NO.	/	0	SOIL AND RO	CK DES	CRIPTION	l
	(ft)	. ,	0.510	0.511	0.510			<u> </u>	70 100	INO.	/MOI	G				
<u>045</u>						<b></b>	<u>Ma</u>	tch Line		<u> </u>	<b>⊢</b>	┨╌╂	Elevation 2,049.6	ft ON C	RYSTALT	
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# STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STATE	STATE P	ROJECT REFERENCE NO.	SHEET NO.	SHEETS
N.C.	8.	1952001	1	15
STATE	PROJ. NO.	F. A. PROJ. NO.	DESCRIP	TION
1	4400	NHF-26-1-(62)23	P.E	
		· - I	CONS	ST.

#### CONTENTS:

SOIL AND ROCK CLASSIFICATION SHEET SITE LOCATION MAP (DRAWING No. 1)
BORING LOCATION PLAN (DRAWING No. 2)
FINAL BORING LOGS
AASHTO/ASTM LABORATORY TEST RESULTS
GRAIN SIZE DISTRIBUTION CURVES
SITE PHOTOGRAPHS

#### CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLIDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REMEMED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL UNIT © (919) 250-408B. THE SUBSURFACE PLANS, FIBEDRING LOGS, ROCK CORES, AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS.

MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS.

THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD.

THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING THE PERMATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE NVESTIGATION MADE OR THE CPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONTINONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE REVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTE — THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE — BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS
FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE
CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

# STRUCTURE SUBSURFACE INVESTIGATION

F.A. PROJECT	NHF-26-1-(62)23
COUNTY	HENDERSON
PROJECT DESCR	IPTION <u>DUAL STRUCTURES ON</u>
I-26 OVER	NORFOLK SOUTHERN RAILROAD
SITE DESCRIPTION	N PROPOSED I-26
OVER	NORFOLK SOUTHERN RAILROAD

STATE PROJECT . 8.1952001 I.D. NO. I-4400

INVESTIGATED BY

CHECKED BY

SUBMITTED BY

DATE

REVISED

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

PERSONNEL M. LEAR

D. WHITE

R. PEED

REVISED

SEAL 1759

LAW LAWGIBB Group Member

Law GIBB Group Member

Law Engineering & Environmental Services, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604
(919) 876-0416

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DRAWN BY: BKB

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

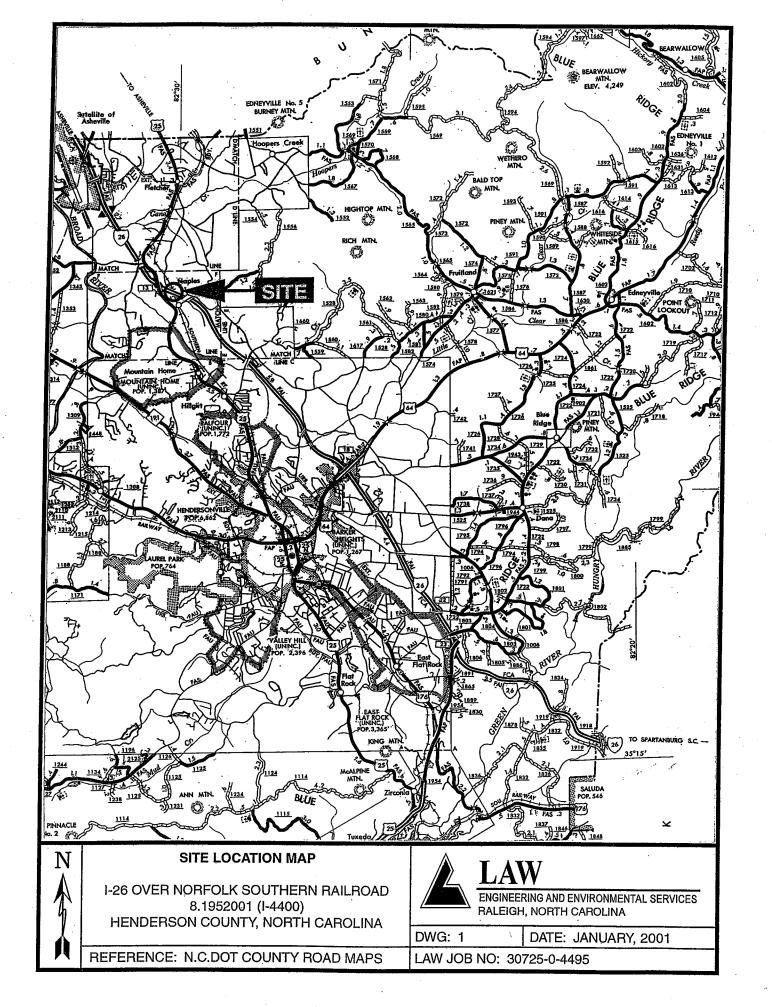
# DIVISION OF HIGHWAYS GEOTECHNICAL UNIT

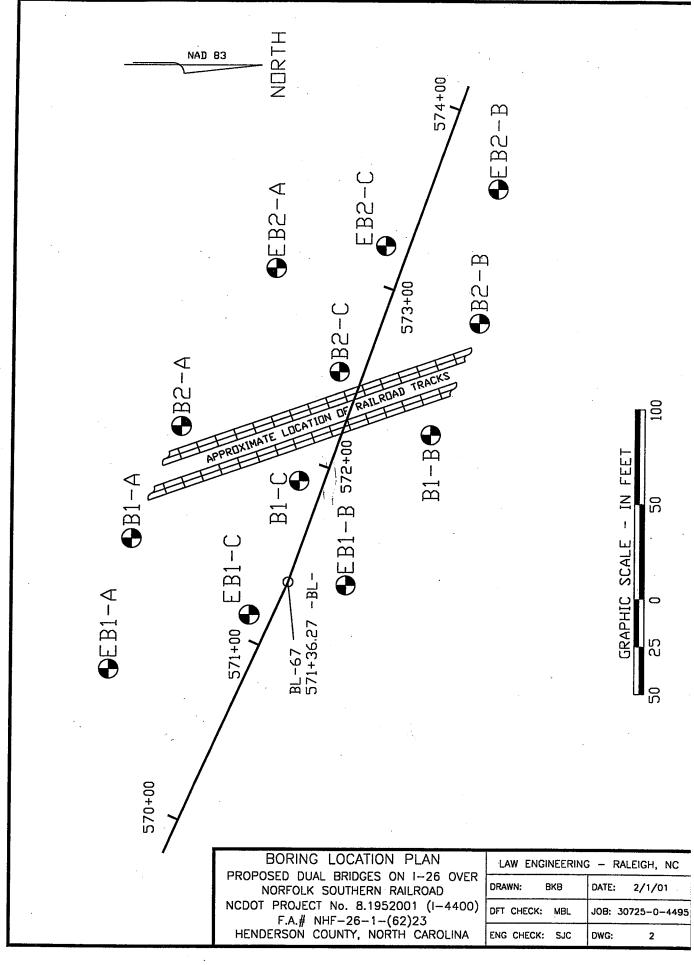
# SUBSURFACE INVESTIGATION

	SOIL AND ROCK LEGEND, TER	MS, SYMBOLS, AND ABBREVIATIONS	
SOIL DESCRIPTION	GRADATION  WELL GRADED: INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE	ROCK DESCRIPTION  HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO TZOR, ASTM D-1588), SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTUTE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARTY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:	UNIFORM INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE, (ALSO POORLY GRADED)  GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.  ANGULARITY OF GRAINS  THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR,	ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL DISTRIBUTION OF REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.  ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:	ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.  AQUIFER - A WATER BEARING FORMATION OR STRATA.  ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS,
VERY STUPP, CRAY SULTY CLAY, MOUST VITHE DISTRIBUTION FIRST SAND LAYERS, BIGHLY PLASTIC, A-7-4 SOIL LEGEND AND AASHTO CLASSIFICATION	SUBANGULAR SUBROUNDED, OR ROUNDED.  MINERALOGICAL COMPOSITION	WEATHERED ROCK (WR) NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.	OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, STATE, ETC.  ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL  AT WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS (≤35% PASSING #200) ORGANIC MATERIALS (>35% PASSING #200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ÉTC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRAINTE, GRIESS, GABBRO, SCHIST, ETC.  NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	GROUND SURFACE. <u>CALCAREOUS (CALC.)</u> - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-8 A-7 A-1, A-2 A-4, A-5 CLASS. A-1a A-1b A-24 A-25 A-26 A-27 A-7-5 A-3 A-6, A-7 SYMBOL 000000000000000000000000000000000000	COMPRESSIBILITY  SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE LIQUID LIMIT 31-60 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.  COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.  CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL
% PASSING #10 50 MX SILT- GRANULAR CIAY #40 30 MX(51 MN SOLS SOLS SOLS SOLS SOLS SOLS SOLS SOL	PERCENTAGE OF MATERIAL  ORGANIC MATERIAL GRANULAR SILT-CLAY  ORGANIC MATERIAL GRANULAR SILT-CLAY	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED WEATHERING	LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.  DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
#40 30 MQ450 MQ451 MM	TRACE OF ORGANIC MATTER 2-3% 3-5% TRACE 1-10%  LITTLE ORGANIC MATTER 3-5% 5-12% LITTLE 10-20%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.  VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PLASTIC INDEX 6 MX N.P.   10 MX  10 MX  11 MN  11 MN   10 MX  10 MX  11 MN  11 MN   LITTLE OR LITTLE OR GROUP INDEX 0 0 0 4 MX 8 MX   12 MX  16 MX  NO MX MODERATE ORGANIC	HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE  GROUND WATER	(V. SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.  SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.  FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
OF MAJOR GRAVELAND FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC MATTER SAND GRAVEL AND SAND SOILS MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING,  STATIC WATER LEVEL AFTER 24 HOURS,	(SLL) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.  MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING AS A EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR POOR UNSUITABLE  P.I. OF A-7-5 SLL 30 : P.I. OF A-7-6 > LL 30	PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA  O-Mills Spring or Seepage	(MOD.)  GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	PARENT MATERIAL. FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY
CONSISTENCY OR DENSENESS    RANGE OF STANDARD   RANGE OF UNCONFINED	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNIC" SOUND WHEN STRUCK.	THE STREAM.  FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
PRIMARY SOIL TYPE COMPACINESS OR CONSISTENCY PENETRATION RESISTENCE (N-VALUE) (TONS/FT²)  GENERALLY VERY LOOSE 4 TO 10	ROADWAY EMBANKMENT WITH SOIL DESCRIPTION  POPT DMT TEST BORING DESIGNATIONS  AUGER BORING S-BUIK SAMPLE  AUGER BORING S-BUIK SAMPLE	SEVERE ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED (SEV.) IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME	<u>JOINT</u> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  LEDGE: A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
COSE	ARTIFICIAL FILL OTHER THAN ROADWAY EMBANIQUENTS	EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.  IF THISTED. YIELDS SIPT IN VALUES > 100 BPF  VERY SEVERE ALL ROCK EXCEPT CHARTZ DISCOLORED OR STATUS. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN
SOFT   2 TO 4   0.25 TO 0.5 TO 0.5 TO 0.5 TO 1	SINDIA INFERRED ROCK LINE  A PIEZOMETER RS - ROCK SAMPLE  INSTALLATION RT - RECOMPACTED  TRIAXIAL SAMPLE  SLOPE INDICATOR  TRIAXIAL SAMPLE	VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED. TIELDS SPT N VALUES < 100 BPF  COMPLETE ROCK REDUCED TO SOIL ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND  SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS  ALSO AN EXAMPLE.	INTERVENING IMPERVIOUS STRATUM.  RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND
TEXTURE OR GRAIN SIZE  U.S. STD. SIEVE SIZE 4 10 40 60 200 270	O SOUNDING ROD CBR - CBR SAMPLE  O SOUNDING ROD	ROCK HARDNESS  VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	EXPRESSED AS A PERCENTAGE.  SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
DPENING (MM)	ABBREVIATIONS	SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK.  HARD  CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS
(BLDR.) (CO8.) (GR.) (CSE.SD.) (F.SD.) (SL.) (CL.)  GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL PMT - PRESSUREMETER TEST BT - BORING TERMINATED SD SAND, SANDY CL - CLAY SL - SILT, SILTY CPT - COME PENETRATION TEST SLI - SLIGHTLY	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
SIZE IN. 12" 3"  SOIL MOISTURE - CORRELATION OF TERMS  SOIL MOISTURE SCALE   FIELD MOISTURE   CHIEF TOO FIT A MOISTURE   CHIEF TO	CSE COARSE TCR - TRICONE REFUSAL  DMT - DILATOMETER TEST 7 - UNIT WEIGHT  DPT - DYNAMIC PENETRATION TEST 7	POINT, OF A GEOLOGISTS FICK	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS.
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR PIELD MOISTURE DESCRIPTION  - SATURATED - USUALLY LIQUID; VERY WET, USUALLY	e - VOID RATIO  F FINE  F FINE  FOSS FOSSILIFEROUS  FRAC FRACTURED  V VERY  VST - VANE SHEAR TEST	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
LASTIC LIQUID LIMIT (SAT.) FROM BELOW THE GROUND WATER TABLE  LASTIC SEMISOLID; REQUIRES DRYING TO  ANALY AND ATTAIN OF THE MARKET DRY	FRAGS FRAGMENTS MED MEDIUM	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(PI) PLASTICLIMIT ATTAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT  ADVANCING TOOLS: HAMMER TYPE:	FRACTURE SPACING BEDDING TERM SPACING TERM THICKNESS	
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:  MOBILE B- CLAY BITS  AUTOMATIC X MANUAL	VERY MIDE	BENCH MARK: BL-67 set by N.C.DOT at station 571+36.27 -BL-  ELEVATION: 2123.33 ft
- DRY - (D) REQUIRES ADDITIONAL WATER TO - DRY - (D) ATTAIN OPTIMUM MOISTURE	6° CONTINUOUS FLIGHT AUGER CORE SIZE:  X 8° HOLLOW AUGERS	MODERATELY CLOSE	NOTES: Geotechnical Exploration
PLASTICITY	CME-45 HARD FACED FINGER BITS	INDURATION	Performed By:
PLASTICITY INDEX (PI) DRY STRENGTH	TUNGCARBIDE INSERTS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	LAW
PLASTIC 0-5 VERY LOW PLASTICITY 6-15 SLIGHT	CME-550 CASING W/ADVANCER HAND TOOLS:	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS;  GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	LAWGIBB Group Member
MED. PLASTICITY 18-25 MEDIUM BIGH PLASTICITY 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	Law Engineering & Environmental Services, Inc. 3301 Atlantic Avenue
COLOR  DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY)	OTHER ACKERAD2 SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	Raleigh, North Carolina 27604 (919) 876—0416
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	OTHER OTHER VANE SHEAR TEST OTHER OTHER	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	

 ID
 STATE PROJECT NO. SHEET NO. TOTAL SHEETS

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SHEET 1 OF 1

<i>,</i> —	ECT NO.					. 1-4400	<del></del>		OUNTY			ON	GEOLOGIST M. LEAR
					NORFOLK								GROUND WATER (ft)
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	AR ELEV			+	THING 6					ING 9			
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DATE	STARTE		/10/01		c	MPLETE	D 1/10/0	)1	SURF	ACE V	VATER	DEF	PTH N/A
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#### N.C.D.O.T. GEOTECHNICAL UNIT BORING LOG

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PROJE	ECT NO.	8.19	52001	, ,		ID.	I-4400		С	OUNTY	HEN	IDERS	ON		GEOLOG	IST B.	BANKS		
SITE D	ESCRIP	PTION	I-26 C	VER N	ORF	OLK S	OUTHER	RN RAILF	OAD (	30725-	0-4495	5)					GROUN	D WATER (f	ft)
BORIN	IG NO.	EB1-E	3	В	DRING	LOCA	ATION	<b>5771.¥416</b> 6	58+93	OFFS	ET 29	XXXX A	40 R	ALIG	NMENT -RK	-L-	0 HR.	CI@40.0ft	
COLLA	R ELEV	/. 212	3.4 ft	NORT	HING	618	,120.49			EAST	ING 9	56,26	3.12				24 HR.	FIAD	
TOTAL	. DEPTH	60.2	ft	DRILI	MAC	HINE	ACKE	R AD2	DRILL	. METH	OD 3	3.25-ID	HS	A		HAMM	ER TYPE	140-lb Man	nual
DATE :	STARTE	ED 1/	9/01			COM	PLETED	1/9/01		SURF	ACE W	/ATER	DEI	PTH N	/A				
ELEV.	DEPTH	BL	ow col	JNT			BLOWS	PER FOO	Т		SAMP.	<b>V</b> /	L		MA HOS	ID BOCK	DESCRIPTION	ON.	
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24 HR. 24 HR. HAMMER TYPE  TO ROCK DESCRIPTIO  RANGE, TAN, WHITE A	20.1 CI@14.2 140-lb Mar
24 HR.  HAMMER TYPE  D ROCK DESCRIPTIO  RANGE, TAN, WHITE A	CI@14.2 140-lb Mar
HAMMER TYPE  ID ROCK DESCRIPTIO  RANGE, TAN, WHITE A	140-lb Mar
ID ROCK DESCRIPTIO	NN AND
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ITLY SANDY, CLAYEY	AND 'SILT
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#### N.C.D.O.T. GEOTECHNICAL UNIT BORING LOG

SENT OF	TRAMEPO													SHEE	T 1 OF	1	
PROJ	CT NO	8.19	52001			ID.	I-4400		C	OUNTY	HEN	DERS	ON	GEOLOGIST M			
SITE D	ESCRI	PTION	I-26 C	VER N	IORF	OLK SO	OUTHE	RN RAILI	ROAD (	30725-	0-4495	5)			GROUN	D WATER (	(ft)
BORIN	G NO.	B1-C		В	ORING	LOCA	TION	57X1 <del>X</del> 86	659+35	OFFS	ET 1/2	XIXIXI 4	1 RT	ALIGNMENT *BKL-	0 HR.	21.4	
OLLA	AR ELE	/. 209	4.5 ft	NOR	THING	618	,095.92			EAST	NG 9	56,20	8.06		24 HR.	CI@19.5	,
OTAL	. DEPTI	45.5	ī ft	DRIL	L MAC	HINE	BK-51		DRILL	. METH	OD 3	3.25-IC	HSA	HAMI.	IER TYPE	140-lb Ma	nu
ATE:	START	ED 1/	23/01			COMI	PLETE	1/23/0	1	SURF	ACE-W	/ATER	DEP	PTH N/A			
ELEV.	DEPTH	BL	ow co	UNT	]			PER FOO			SAMP	$\nabla$	L	SOIL AND ROCK	DESCRIPTIO	N	
(ft)	(ft)	0.5ft	0.5ft	0.5ft	P	20	40	60	80 	100	NO.	MO					
				Ī									.				
2094.5							GROUN	D SURFA	ACE .					2094.5			
				<u> </u>	ļ							1	N	- ALLUVIUM: BLACK, SII WOOD FRAGMENTS,			
-	- - 4.0												N	ORGANIC DEBRIS		O TITLE IX	
2090 -		5	5	5	1 : : ,	 <b>●</b> 10 · ·						М		<del>-</del> -			
·	-				1 : :	1.		 						-			
-	- - 9.0					:\:::		 		: : :			N	•			
2085	_	5	7	10	::	17				: : :		M		72084.2 RESIDUAL: TAN, ORAI	IGE BLACK	TAN	1
1	- -					.								GREEN AND WHITE, S CLAYEY SILT (A-4) WI	LIGHTLY SAN	IDY,	
2080	- 14.0 -	5	5	7		T.:::						м		FABRIC FABRIC	III NELIOT NO		
	-			'		712 :						""		•			
+	- - 19.0				: : ,	[:::		· · · · ·									
2075	- 19.0	3	4	4	: :	/ 18 · · ·						w	I I	- -			
1	- -	:			::/								F	•			
‡	- - 24.0				1:1									•			
2070 -	-	3	3	3	•6							SAT		<del>-</del>			
1	-				<i>[</i> :									· ·			
2065 -	- 29.0	4	4	5	::					: : :		SAT	M	, _			
2003		-	7	٦	•							JOAT			•		
Ŧ										: : :			<b>-</b>	•			
2060	- 34.0	7	15	19		 				: : :		M-W	F	· <del>-</del>			
‡	-							<u> </u>	· · · ·	<del>: : ;</del>			me-	2058.0 WEATHERED ROCK (G	NEISS) SAME	DIED AS	_ 3
‡	- - 39,0									::		ŀ	W	GREEN AND WHITE, S WITH RELICT ROCK FA	ANDY, CLAYE		
2055		26	52	100/.4					10	00/.9ft		Ì			ABRIC	•	
‡										<del>``</del>				RESIDUAL: GREEN AN			_ 4:
2050	44.0	46	17	21								м		SANDY, CLAYEY SILT ( ROCK FABRIC AND GF	AVEL-SIZED		
						· · · · · ·	- • •38-	<u> </u>	• • • •					2049.0 AND FELDSPAR FRAG BORING TERMINATED	AT 45.5 ft (EL		45
1	.											ļ.,	ŀ	2049.0 ft) IN RESIDUAL (A-4)	: HARD CLAY	EY SILT	
Ŧ	-		·										F	-			
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SHEET 1 OF 1

RO II	ECT NO.	2 10	952004		ID.	1-4400		OLINTY	/ LIEN	DEBO	· ON		EEI 1 OF	
<u> </u>				N/55 :				OUNTY			ON	GEOLOGIST		
	DESCRIP		I-26 C		<del></del>	OUTHERN RAILI				<u> </u>		٠.	GROUN	D WATER (
		B2-A		В	ORING LOCA	TION \$7/13/96	559+40	OFFS	ET 79	MININ (	62 L'	TALIGNMENT XXL-	0 HR.	20.3
COLL	AR ELEV	. 209	91.7 ft	NOR	THING 618,	035.69		EAST	ING 9	56,17	9.40		24 HR.	CI@17.2
TOTAL	L DEPTH	55.5	5 ft	DRIL	L MACHINE	BK-51	DRILL	METH	OD 3	.25-ID	HSA	А НА	MMER TYPE	
DATE	STARTE	D 1/	/22/01		COMF	PLETED 1/22/01			ACE W			<del></del>		
ELEV.	DEPTH		OW CO	UNT	1	BLOWS PER FOO		1	SAMP.		1 1			
(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 20	40 60	80	100	1	/	0	SOIL AND RO	CK DESCRIPTIO	N
	` '			<del>                                     </del>		<del></del>				MOI	G		<u> </u>	
					İ	•						•		
2091.7					G	ROUND SURFA	CE	İ				2091.7		
2090 -	ΕT											<ul> <li>RESIDUAL: TAN, BR</li> </ul>		
2090 -	Ŧ ,,			]								<ul> <li>AND WHITE, SLIGH</li> <li>SILT (A-4) WITH RE</li> </ul>	LICT ROCK FABI	RIC,
-	4.0	4	3	5						м		<ul> <li>QUARTZ SEAMS AN</li> <li>QUARTZ FRAGMEN</li> </ul>	ID GRAVEL-SIZE	:D
- 2085 -	‡											•		
_555	9.0							: : :			M	•		
1	<del></del>	3	4	6	10					M		<del>-</del> <del>-</del>		
2080	‡							]				- -		
	14.0											•		
1	F	3	4	6	1 • 10			: : :		SAT		•		
2075	F				1::1:::			: : :			<b>X</b>	• <del>-</del>		
1	19.0				]						<b>//-</b>	•		
+		2	3	5	· • • • • · · ·			: : :	ļ	\$ <sub>₹</sub>	ØF			
2070					: :   : : :		<b>.</b> . 	: : :			<b>%</b>	<u>-</u>		
) ‡	24.0				1::1:::		: :\i:::				<b>**</b>			
f		3	5	6	•11				İ	SAT	<b>%</b> }			
2065	-							: : :			<b>%</b> [	<del>-</del>		
‡	29.0							: : :			<b>*</b>			
‡	-	2	3	7	• 10 · ·				i	SAT	継			
2060	-										<b>%</b>	-		
Į	34.0						· · · ·	: : :			繎			
‡	-	3	7.	10	17.			: : :		SAT	<b>*</b>		i.	
2055	-	İ								200	<b>%</b> t	•		
ŧ	39.0	7	13	27		$\sum_{i=1}^{n} \frac{1}{i} $				ا بم	¥			
‡		'		۷.		40		: : :		w	繆			
2050 +		- 1						: : :			<b>*</b>	-		
ŧ	44.0	9	17	25		$\cdots 1$ .				M-W	₩-			
, F	-	-	"				<u></u> .			.vvv	<b>#</b>	2045.2		
2045 <del> </del>  -				ĺ		<del></del>				Ř	197	WEATHERED ROCK GREEN AND WHITE,	(GNEISS) SAMP	LED AS
ŧ	49.0	33	67/.4							l)	1	CLAYEY SILT WITH F	RELICT ROCK FA	BRIC
040				1			100	0/.9ft			MA	AND GRAVEL-SIZED		
Ŧ	54.0										ØF	RESIDUAL: GREEN A SANDY, CLAYEY SILT		HTLY
‡		28	24	30						м-w	<b>*</b>	ROCK FABRIC 2036.2	· v·a) miii iXEi	
土						<b>₩</b>			_	X		BORING TERMINATE		
+				j				1			F	2036.2 ft) IN RESIDUA (A-4)	AL: HARD CLAYE	Y SILT
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# N.C.D.O.T. GEOTECHNICAL UNIT

OF SERVICE	TRAMBES!	,												SHI	EET 1.OF	1
PROJ	ECT NO	<b>).</b> 8.19	52001			ID. I-4	400		С	OUNT	Y HEI	NDERS	SON	GEOLOGIST		<del></del>
SITE D	ESCRI	PTION	I-26 (	OVER N	NORF	OLK SOU	THER	N RAILF	ROAD (	30725	-0-449	5)			GROUN	D WATER (ft)
BORIN	G NO.	B2-B		В	ORIN	G LOCATI	ON 🏋	7/2X <del>1</del> 9/8 (	660+48	OFF	SET X	XfXFXT:	57 R	T ALIGNMENT - 1814L-	0 HR.	19.2
COLLA	AR ELE	<b>V</b> . 209	94.9 ft	NOR.	THIN	G 618,18	8.53			EAS'	TING	956,12	4.50		24 HR.	CI@4.8
TOTAL	. DEPT	H 44.6	5 ft	DRIL	L MA	CHINE B	K-51		DRILL	. METI	HOD :	3.25-IC	) HS	A HAI	VIMER TYPE	140-lb Manual
DATE	START	ED 1/	/23/01			COMPLI	TED	1/23/01		SUR	FACE V	VATER	DE	PTH N/A		
ELEV.	DEPTH	I BL	ow co	UNT		. В	.ows	PER FOO	T		SAMP	· 🔻	L	SOIL AND BO	CK DESCRIPTION	DN.
(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	20	40	60	80	10	0 NO.	МО	ı G	SOIL AND RO	CR DESCRIPTIO	JN 
2094.9						GR	DUND	SURFA	CE .					2094.9		0.0
	-													RESIDUAL: GRAY, C		N,
-	4.0										1			RELICT ROCK FABR	SIC OILT (A	(-1) *******
2090 -	- <del>- 1.0</del> -	11	14	13	: :							М		<b>-</b> -		
-	-				1 : :	::::/:::								<del>-</del>		
-	9.0	<u> </u>		<u> </u>	] : :	· /: : :								-		
2085	_	4	6	7	: :	13						М		<del> -</del> -		
1	-					: 1 : : :								<u>.</u>		
2080	14.0	7	8	9		1						м				
2000	-					. <b>7</b> 16						"				
1	19.0			·	: :	:					1			-		
2075	-	3	5	7	1::	12						M-W		<b>-</b> →		
‡	-					: \ : : :								<del>-</del> -		
‡	24.0				: :	::\::::		 						<b>-</b> -		
2070	<u>.</u>	6	8	13		21						М		<del>_</del> -		
+	-													-		
2065	29.0	4	8	12								м		- -		
2005	•											""		<del>-</del> -		
Ŧ	34.0				::									<del>.</del> •		
2060	-	7	13	23		:::::	<b>₽</b> 36	 				М		- <del>-</del>		
‡							٠			<del></del>			net	2058.4 WEATHERED ROCK	(GNEISS) SAMI	PLED AS 36.5
‡	39.0						 						W	GREEN, SLIGHTLY S WITH RELICT ROCK	SÁNDY, CLAYEY	
2055	-	100/.4						 		0/.4ft♥			<b>K</b> //	GRAVEL-SIZED ROC		;
<u> </u>								<i></i>					刿	•		
	44.0	75	25/.1-			· · · · ·			<u>1</u> 0	0/.6ft			16	2050.3		44.6
+	,												-	BORING TERMINATE 2050.3 ft) IN WEATH		
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SHEET 1 OF 1

201	ECT NO.	0 1	252004			ID.	1.4400		1 ~	71121	/ 115	IDECC			1 1 OF	1
							1-4400				/ HEN		ON	GEOLOGIST M.		
	DESCRIF		I-26 C				DUTHER					<u> </u>		٠.	GROUN	D WATER (fi
BORIN	IG NO.	B2-C		В	DRING	LOCA	TION X	72X50 (	659+95	OFFS	ET 1/2	KMX	CL	ALIGNMENT XXL-	0 HR.	22.6
COLL	AR ELEV	. 209	93.5 ft	NOR	THING	618,	,116.43			EAS1	ING 9	56,15	0.40		24 HR.	CI@13.7
TOTAL	L DEPTH	44.2	2 ft	DRIL	L MAC	HINE	BK-51		DRILL	METH	IOD 3	.25-ID	HSA	HAMM	ER TYPE	140-lb Man
DATE	STARTE	D 1	/23/01			COME	PLETED	1/23/01	<del></del>		ACE W					170-10 101011
ELEV.	DEPTH		.ow co	INT	<del></del>		BLOWS				SAMP.		1	111 11//		
(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	20	40	60.	'.' 80	. 100	1		ō	SOIL AND ROCK	DESCRIPTION	ON
(14)	1.09	0.010	0.011		-			<u> </u>			NO.	MOI	G			
					1		. *									
2093.5					1		ROUND	SURFA	CE					2093.5		*
												<del>                                     </del>	XXX	RESIDUAL: ORANGE, T	AN, WHITE,	GREEN,
	‡				1 : : :							ĺ		DARK BROWN AND PIN CLAYEY SILT (A-4) WIT	IK, SLIGHTL	Y SANDY,
2090 -	4.0	3	4	5								D-M		<ul> <li>FABRIC AND GRAVEL-</li> </ul>		
	+	J	-		7.	9						D-IVI		FRAGMENTS		
	Į				1::1:									• •		
2085 -	9,0	3	3	3	1:7:							D.M.		<del>-</del>		•
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2080 -	- 14.0	3	4	6	1 :: [	• • •		<i>.</i> .				.,	▓╁	<del>-</del>		
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2075 -	- 19.0				1.7.								<b>%</b> -	-		
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)70-	- 24.0								: .\: :				<b>\</b> _	-		
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2065	- 29.0													•		
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2060 -	34.0					1::					- 1	ĺ		-		
Ī	:	5	7.	10		17					1	M-W	鮏			
+	.			ļ		:	· · · · ·			<u> </u>			nel-	_2057.0 WEATHERED ROCK (GN	IFISS) SABAR	51 ED 45 - 3
2055	- 39.0									·			1//	. GREEN AND WHITE, SLI	GHTLY SAN	DY,
Í		25	75/.4							/.9ft♥	1		於	CLAYEY SILT WITH REL AND GRAVEL-SIZED RO		
Ŧ	.	1										6	)((J			
2050 🕂										-		1	17	2040.3		
f		100/.2	<del></del>		<u></u>	<del></del>	<u> </u>	<del></del>	100	7.Żπ <b>•</b>			~	2049.3 BORING TERMINATED A		
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# N.C.D.O.T. GEOTECHNICAL UNIT BORING LOG

OF OF	TRANSES		•												•	SHEE	T 1.0F	1	
PROJE	CT NC	0. 8.1	952001			ID.	I-4400		C	OUNT	Y HEN	IDER:	SON		GEOLOG				-
SITE D	ESCRI	PTION	1-26 (	OVER N	ORF	OLK S	OUTHER	N RAILF	OAD	(30725	-0-449	5)					GROUN	D WATER	(ft)
BORIN	G NO.	EB2-	A	В	ORING	S LOCA	ATION S	<b>572390</b> 6	60+3	OFFS	SET )62	XXXXT	51 L	T ALIGN	MENT XBL	X -L-	0 HR.	CI@56.	0
COLLA	R ELE	V. 21	21.6 ft	NOR'	THING	618	,083.14			EAST	ING 9	956,09	5.75				24 HR.	FIA	D
TOTAL	DEPT	H 59.	5 ft	DRIL	L MAC	CHINE	ACKEF	R AD2	DRIL	L METH	OD 3	3.25-1	) HS	A		HAMM	ER TYPE	140-lb M	anua
DATE	START	ED 1	/10/01			сом	PLETED	1/10/01		SURF	ACE V	VATE	R DE	PTH N/A					
ELEV.	DEPTH	Ві	LOW CO	UNT			BLOWS	PER FOO	Т		SAMP	. 🔻	1		SOIL AI	UD BOCK	DESCRIPTION	ON.	
(ft)	(ft)	0.5ft	0.5ft	0.5ft	P	20	40	60 I	80 	100	NO.	МС			301L AI	ND ROCK	DESCRIPTIO	PIN	
2121.6						. (	GROUND	SURFA	CE	_				2121.6				•	(
2120	-		1	1					· · · ·		<del>                                     </del>	1	⊕ <sub>æ</sub> . -, ⊕.		ONCRETE V	VITH REB	AR		
2120	- 3.0	8	3	4	: :				 					r e	ROWN, GRE	EN AND	NT FILL: RE WHITE, SANI	DY.	
	-	°	"	"	1:1	)7 · · ·			 	· · ·		M		[ 0	LAYEY, SILT	`(A-4) WI`	TH GRAVEL-	SIZED	
2115	-			]	: :				 		1			- '					
‡	- 8.0 -	3	4	5	1::	9			 			м		<del>-</del>					
‡	•				: : '									<del>-</del>					
2110	- · 13.0					 								<del>-</del>					
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2105						.\								<u>-</u>					
‡	18.0	4	8	9	: :	: [ : :						D-M		<del>-</del>					
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2100	23.0				::	:/::::													
F	20.0	3	4	5		9						D-M		-					
Ŧ					::	<i>.</i> .								20 <u>96</u> .1	ESIDITA! - PI	NK WHIT	E, ORANGE,	TAN AND	25
2095	28.0				: :			<i>.</i>						_ в	ROWN, LOC	ALLY MIC.	ACEOUS, SL A-4) WITH RE	IGHTLY	
‡		4	4	5	: :	9 · · ·				: : :		D-M		- 8	OCK FABRIC	AND QU	ARTZ FRAGI	MENTS.	
2090					::									- -					
‡	33.0	3	4	4								D-M		• •					
‡					T									• -					
2085	38,0													-					
£		3	3	3	. •6				: : :	: : :		D-M		-					
2080																			
2080 T	43.0					· · · ·				: : :				<del>-</del> ·					
Ŧ		3	2	3	• •5					: : :				· N	O RECOVER	Y AT 43.0	ft		
2075					: L:									<del>-</del>					
<b>‡</b>	48.0	3	3	5	: :1:							M-W		•					
‡														· .					
2070 🛨	53.0	•																	
F		2	3	5	•	3 · · ·						w							
2005					:: }	\		 		:::		,		•					
2065+	58.0					/:::			: : :	: : :		84 147	<b>                                     </b>						
-		5	8	9		<b>♦17</b> ·	• • • • •	· · · · ·				M-W	<u> </u>	2062.1	ORING TERM	INATED 4	T 59.5 ft (EL	EV	59.
‡	1									1				_ 20	62.1 ft) IN RE	ESIDUAL:	STIFF CLAY	EY SILT	
‡	ŀ				2					İ				Α)	-4)				
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SHEET 1 OF 1

	ROJ	ECT NO.	8.19	52001			ID. I-	4400		С	OUNT	/ HEN	IDERS	SON	GEOLOGIST B.E	BANKS/M. LEAR
1	SITE	DESCRIF	MOIT	I-26 (	OVER N	ORFO	LK SO	UTHER	N RAIL	ROAD (	30725	0-449	5)		٠.	GROUND WATER (ft)
	BORIN	IG NO.	EB2-l	3	В	ORING	LOCAT	TION )	<b>578</b> 148	661+	5FFS	ET X	XtXX	38	RALIGNMENT - MAK-L-	0 HR. CI@44.0ft
	COLL	AR ELEV	/. 212	1.4 ft	NORT	THING	618,1	97.66			EAST	ING 9	956,05	3.87		24 HR. FIAD
	TOTAL	L DEPTH	50.0	) ft	DRIL	L MACI	HINE	ACKEF	R AD2	DRILL	. METH	IOD 3	3.25-IC	HS/	A HAMMI	ER TYPE 140-lb Manual
	DATE	STARTE	D 1/	9/01			COMP	LETED	1/9/01		SURF	ACE V	VATER	DEF	PTH N/A	
	ELEV.	DEPTH	BL	ow co	UNT			BLOWS	PER FO	ОТ		ŜAMP	. 🔻	0 L	SOIL AND BOOK	PECCULATION
	(ft)	(ft)	0.5ft	0.5ft	0.5ft	19		40 	60 	. 80	100	NO.	MO		SOIL AND ROCK	JESCRIPTION .
						}										
	2121.4						GI	ROUND	SURE	ACE						
ľ	2120-				1		<u> </u>					<b></b>	<del> </del>	= <u>-</u> -	2121.4 - CONCRETE WITH REBA 2119.6	
-	2120	3.5													- ROADWAY EMBANKME	
		- 1	4	5	5	] : : •	10						. M		- MICACEOUS, SANDY, C	LAYEY SILT (A-4)
	2115-	F													<del>-</del>	
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	2100	-					1:::								CLAYEY SILT (A-4) WITH STRUCTURE	I RELICT ROCK
	) ]	23.5	4	8	8		1:::			: :\: :					•	
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	1	: ]	11	15	14		: : : <b>&gt;</b> :	29	<i>.</i>		: : :		M-D	<b>%</b> -		
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ı	+												ŀ	-	BORING TERMINATED A 2071.4 ft) IN RESIDUAL: S	STIFF SILT (A-4)
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#### N.C.D.O.T. GEOTECHNICAL UNIT BORING LOG

SHEET 1 OF 1

ATE STARTED	W. OF	TRANS															SHEE	T 1 OF	1
DRING NO.   EB2-C	PROJE	CT NO	. 8.19	952001			ID.	1-4400		С	OUNTY	HE	NDERS	ON		GEOLOG	IST M.	LEAR	
COLLAR ELEV. 2120.8   NORTHING   618,140.13	SITE D	ESCRI	PTION	1-26 (							·		•					GROUN	ID WATER (f
OTAL DEPTH   55.5 ft   DRULL MACHINE   ACKER AD2   DRULL METHOD   3.25-ID HSA   HAMMER TYPE   140-Ib Mar    ATE STARTED   1/11/01   COMPLETED   1/11/01   SURFACE WATER DEPTH   N/A    ELEVA DEPTH   N/A   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNTY   SUM COUNT	BORIN	G NO.	EB2-(	C	В	ORING	G LOCA	ATION	X7X+X2X	660+	75FFS	ET 1	exxt2	2 LT	ALIGN	MENT -BL	-	0 HR.	CI@50.0
ATE STARTED 1/11/01   COMPLETED 1/11/01   SURFACE WATER DEPTH N/A	COLLA	R ELE	V. 212	20.8 ft	NOR	THING	618	3,140.13	3		EAST	ING	956,08	3.76				24 HR.	CI@50.0
ELEV. DEPTH   SLOW COUNT   C(f)   0.5ft   0.5f	TOTAL	DEPTH	<b>4</b> 55.5	5 ft	DRIL	L MAC	CHINE	ACKE	ER AD2	DRILL	. METH	OD	3.25-ID	HSA	١		HAMM	ER TYPE	140-lb Man
(R) (R) 0.5R 0.5R 0.5R 0.5R 0.20 40 60 80 100 NO. MO G SOIL AND ROCK DESCRIPTION  2120.8  GROUND SURFACE  2120.8  ROADWAY EMBANKMENT FILL: RED. BROWN GREEN, TAN AND ORANGE PLAYER GREEN, TAN	DATE S	STARTE	ED 1/	/11/01			COM	PLETE	D 1/11/01		SURF	ACE V	NATER	DEP	TH N/A				
2120.8   GROUND SURFACE   2120.8   GROUND SURFACE   2120.8   GROUNG GREEN, TAN AND GRANGE GROCK FRAGMENTS   GROCK FRAGME	1			1							400	ł	17			SOIL AN	ID ROCK	DESCRIPTION	ON
2110	(ft)	(ft)	0.5ft	0.5ft	0.5ft	10	20			80	100	NO.	MO		<del></del>				
2110																			
4.0	2120.8						(	GROUN	ID SURFA	CE .					2120.8		-		
115	2120	<del>-</del>		ĺ									İ		. 8	ROWN, GRE	EN, TAN	AND ORANG	BE,
2110	‡	- - 4.0			<u></u>	] : :									. C	LAYEY SILT ROCK FRAGM	(A-4) WIT IENTS	TH GRAVEL-	SIZED
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2110			,			1 : :	: :[:::												
14.0 3 4 5 6 0 19.0 5 5 5 5 10 10 D 2008.8 RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY SILT (A-4) M 2005.3 TO RESIDUAL: LIGHT TO DARK GREEN, TAN, ORANGE, WHITE AND BROWN, CLAYEY STIFF, CLAYEY STI	1	9.0	6	7	9	1 : :	. 16						м						
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2090 34.0 5 5 7 9 12 D  39.0 2 3 4 7 W  44.0 070 3 4 6 16 W  54.0 5 7 9 16 M  2085.3 H) IN RESIDUAL: VERY STIFF, CLAYEY SILT (A-4)	2095 🕇						<i>[:::</i>			• • • • • • • •					- R	OCK FRAGM	ENTS (GI	NEISS)	
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085	090 +		3	3	4	. +	7						D	<b>**</b>	_				
39.0 2 3 4 7 M  44.0 2 3 4 7 W	Ė					\								æ					
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39.0  2 3 4  7  44.0  2 3 4  7  W	2085 🕂			·			7:2: :												
44.0  2 3 4  7  49.0  5 7 9  16  M  2065.3  BORING TERMINATED AT 55.5 ft (ELEV. 2065.3 ft) IN RESIDUAL: VERY STIFF, CLAYEY SILT (A-4)	Ŧ	39.0				: : <sub> </sub>	<i>[</i> . ] ] ]												
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2 3 4 7 W  49.0 3 4 6 10 W  54.0 5 7 9 16 M  2065.3  BORING TERMINATED AT 55.5 ft (ELEV. 2065.3 ft) IN RESIDUAL: VERY STIFF, CLAYEY SILT (A-4)	7													<b>%</b> F	•				
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5 7 9 16 M 2-2065.3  BORING TERMINATED AT 55.5 ft (ELEV. 2065.3 ft) IN RESIDUAL: VERY STIFF, CLAYEY SILT (A-4)	2070 +		-			. :	1:::				2								
BORING TERMINATED AT 55.5 ft (ELEV. 2065.3 ft) IN RESIDUAL: VERY STIFF, CLAYEY SILT (A-4)	<u>‡</u>	54.0					: \ : :				: : :								
2065.3 ft) IN RESIDUAL: VERY STIFF, CLAYEY SILT (A-4)	‡		5	7	9		· • 16 ·	· · · ·		<del></del>			M			ORING TERM	INATED	AT 55 5 # /EI	EV
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## LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

3301 ATLANTIC AVENUE RALEIGH, NC 27604

### N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

Law Project Name and Number: I-26 OVER NORFOLK SOUTHERN RAILROAD 30725-0-4495

Project: 8.1952001 (I-4400)

**County: HENDERSON** 

Owner: N.C.D.O.T.

Date Sampled: JANUARY 2001

Received: 1/12/01

Reported: 1/23/01

Sampled from: EB1-B, EB1-C

By: B. K. BANKS

Submitted by: Law Engineering and Environmental Services, Inc.

1992 Standard Specifications

**TEST RESULTS** 

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained 4.75 mm Sieve	(%)	0.0	0.0	0.0	39.2	0.0	0.0
Passing 2.00 mm Sieve	(%)	100.0	100.0	100.0	60.8	100.0	100.0
Passing 425 µm Sieve	(%)	95.5	94.9	98.6	50.6	92.8	98.3
Passing 75 µm Sieve	(%)	64.9	76.4	87.9	28.4	66.2	67.2

MINUS 2.	nnm	EDA	CTI	ON
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SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	9.5	9.0	3.1	55.3	13.0	7.0
Fine Sand Ret - 53 µm	(%)	39.9	21.8	17.4	22.1	30.8	39.3
Silt 0.05 - 0.005 mm	(%)	36.4	22.7	32.3	15.0	26.8	41.9
Clay < 0.005 mm	(%)	14.2	46.5	47.2	7.6	29.4	11.8

			property seems of the				
Moisture Content	(%)	22.3	26.2	27.3		23.4	41.0
Liquid Limit, L.L.		36	42	32	20	31	33
Plasticity Index, P.I.		5	14	8	1	. 5	1
AASHTO Classification		A-4 (3)	A-7-6 (11)	A-4 (7)	A-2-4 (0)	A-4 (2)	A-4 (1)
Organic Content	(%)		200				====

Boring No.	2.	EB1-C	EB1-C	EB1-C	EB1-C	EB1-B	EB1-B
Station							-
Offset						,	
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (ft)	From	14.0	34.0	44.0	54.2	4.0	54.1
	to	15.0	35.0	45.0	55.0	5.0	55.1

REMARKS:





## LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

**3301 ATLANTIC AVENUE** RALEIGH, NC 27604

### N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

Law Project Name and Number: I-26 OVER NORFOLK SOUTHERN RAILROAD 30725-0-4495

Project: 8.1952001 (I-4400)

**County: HENDERSON** 

Owner: N.C.D.O.T.

Date Sampled: JANUARY 2001

Received: 1/12/01

Reported: 1/23/01

Sampled from: EB2-C, EB1-A

By: B. K. BANKS

1992 Standard Specifications

Submitted by: Law Engineering and Environmental Services, Inc.

**TEST RESULTS** 

Lab Sample No.		SS-7	SS-8	SS-9			
Retained 4.75 mm Sieve	(%)	0.0	0.0	0.0			
Passing 2.00 mm Sieve	(%)	100.0	100.0	100.0			
Passing 425 µm Sieve	(%)	86.6	98.7	88.2			
Passing 75 µm Sieve	(%)	63.0	89.7	48.0		-	

**MINUS 2.00mm FRACTION** 

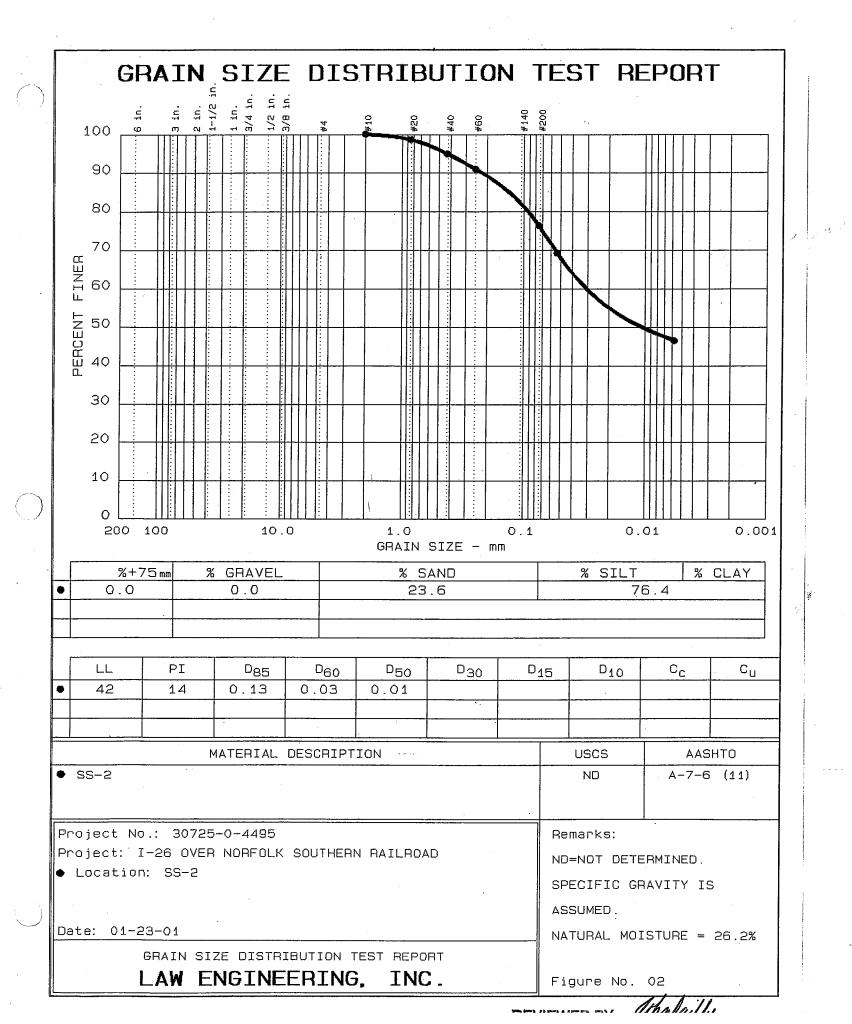
SOIL MORTAR - 100%				· · · · · · · · · · · · · · · · · · ·	*	
Coarse Sand Ret - 250 µm	(%)	19.5	3.7	20.8		
Fine Sand Ret - 53 µm	(%)	25.8	32.5	41.9		
Silt 0.05 - 0.005 mm	(%)	38.0	49.9	23.9		
Clay < 0.005 mm	(%)	16.7	13.9	13.4		

Moisture Content	(%)	25.7	26.1			
Liquid Limit, L.L.		36	37	21		
Plasticity Index, P.I.		4	5	2		
AASHTO Classification		A-4 (2)	A-4 (6)	A-4 (0)		
Organic Content	(%)		*****			

Boring No.		EB2-B	EB2-B	EB1-A		
Station					,	
Offset						
Alignment		-L- ·	-L-	-L-		
Depth (ft)	From	9.0	29.0	53.5		
	to	10.0	30.0	54.5		

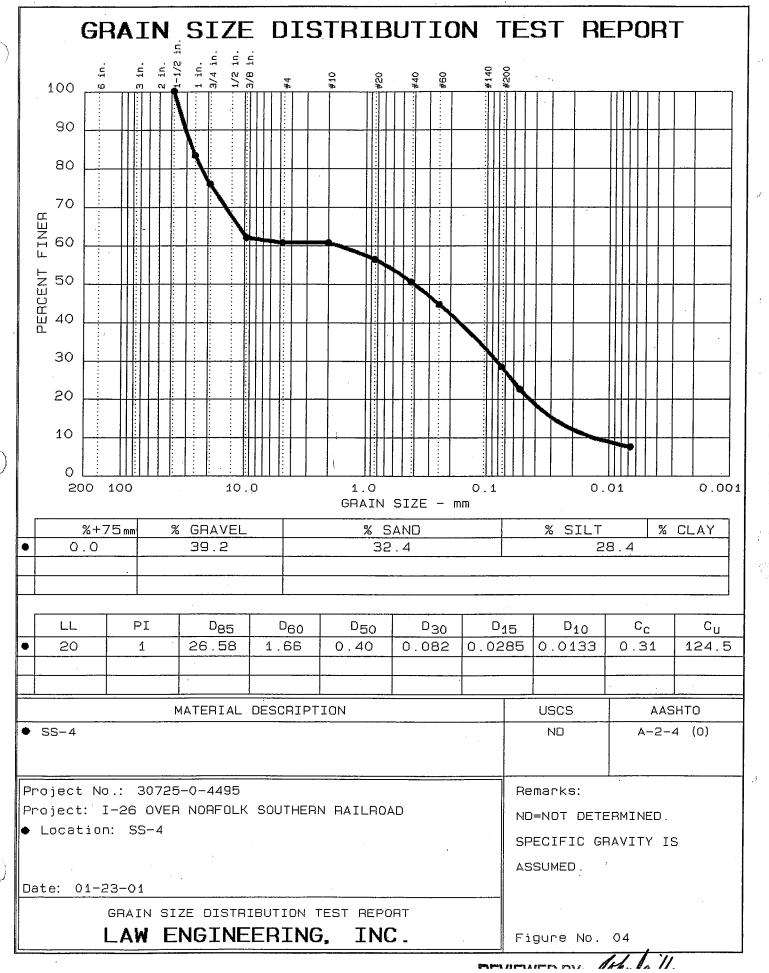
**REMARKS:** 

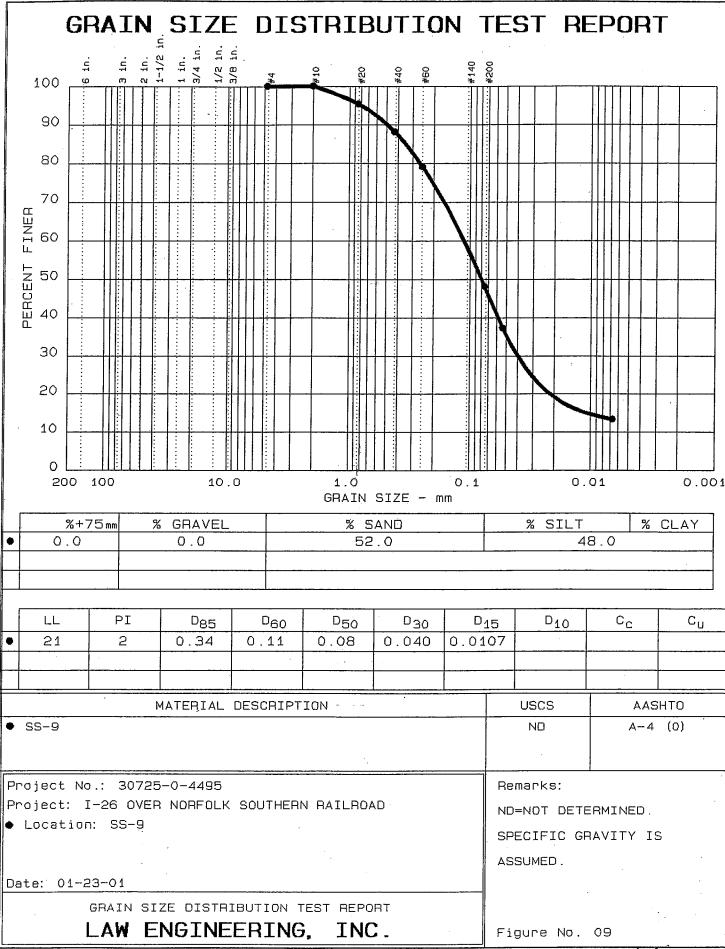
\01-04495d02.xls



#### GRAIN SIZE DISTRIBUTION TEST REPORT 80 70 FINER 9 PERCENT 0 0 0 30 20 10 10.0 0.1 0.01 0.001 200 100 1.0 GRAIN SIZE - mm % GRAVEL % SILT % CLAY %+75 mm % SAND 87.9 0.0 0.0 12.1 LL ΡI $C_{\mathbf{U}}$ D<sub>85</sub> D<sub>60</sub> D50 D30 D<sub>15</sub> $D_{10}$ 32 8 0.07 0.02 0.01 AASHTO MATERIAL DESCRIPTION USCS ● \* ŚS~3 ND A-4 (7) Project No.: 30725-0-4495 Remarks: Project: I-26 OVER NORFOLK SOUTHERN RAILROAD ND=NOT DETERMINED. ● Location: SS-3 SPECIFIC GRAVITY IS ASSUMED. Date: 01-23-01 NATURAL MOISTURE = 27.3% GRAIN SIZE DISTRIBUTION TEST REPORT LAW ENGINEERING, INC. Figure No. 03

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Photograph 1: View looking south along End Bent 1. EB1-C in foreground.



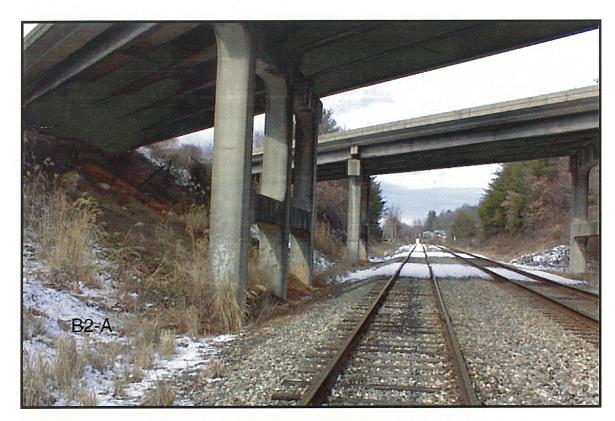
Photograph 2: View looking north along End Bent 1. EB1-C in foreground.



Photograph 3: View looking north along Bent 1. B1-A in foreground.



Photograph 4: View looking south along Bent 1. B1-B in foreground.



Photograph 5: View looking north along Bent 2. B2-A in foreground.



Photograph 6: View looking north at B2-B.



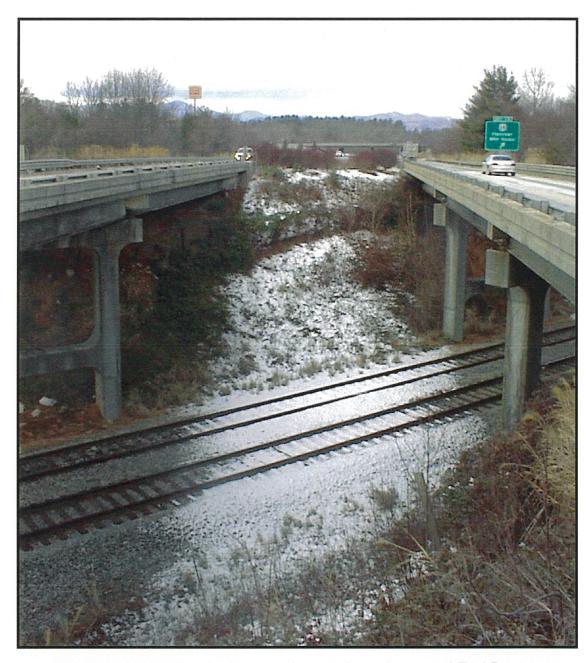
Photograph 7: View looking south along End Bent 2. EB2-B in foreground.



Photograph 8: View looking north along End Bent 2. EB2-C in foreground.



Photograph 9: View looking southeast along -L- toward End Bent 1.



Photograph 10: View looking northwest along -L- toward End Bent 2.

REFERENCE

## STATE OF NORTH CAROLINA

**DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

**CONTENTS** 

SHEET NO. **DESCRIPTION** TITLE SHEET LEGEND (SOIL) SITE PLAN **BORELOGS** 

# **STRUCTURE** SUBSURFACE INVESTIGATION

COUN	TY_	HENDERS	ON							
		DESCRIPT		1-2	6 F	ROM	US-2	25 BL	JSINES	S
			(EXIT	44)	ТО	NEAR	NC-	-280	(EXIT	40
SITE	DES	CRIPTION _	EXT	END	EX	ISTING	CUL	_VER	Г #02	36
		CROSSING								
		0	PROJE	CT S	TΑ	TION -	L- 1	769+9	3.36	

STATE PROJECT REFERENCE NO. 5 I-4400C

#### **CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNDS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU INH-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY YARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS,

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO HE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED OF PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

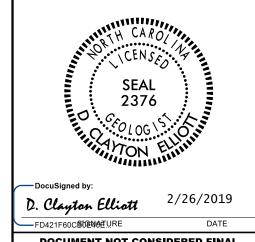
- NOTES:

  1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PROJECT.

  2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

F&R CONSULTANTS D. RACEY N. CONSIGLI S. WOODS INVESTIGATED BY D. RACEY/DC ELLIOTT DC ELLIOTT JC KUHNE SUBMITTED BY \_\_JC KUHNE

**PERSONNEL** 



DOCUMENT NOT CONSIDERED FINAL **UNLESS ALL SIGNATURES COMPLETED** 

PROJECT REFERENCE NO. SHEET NO.

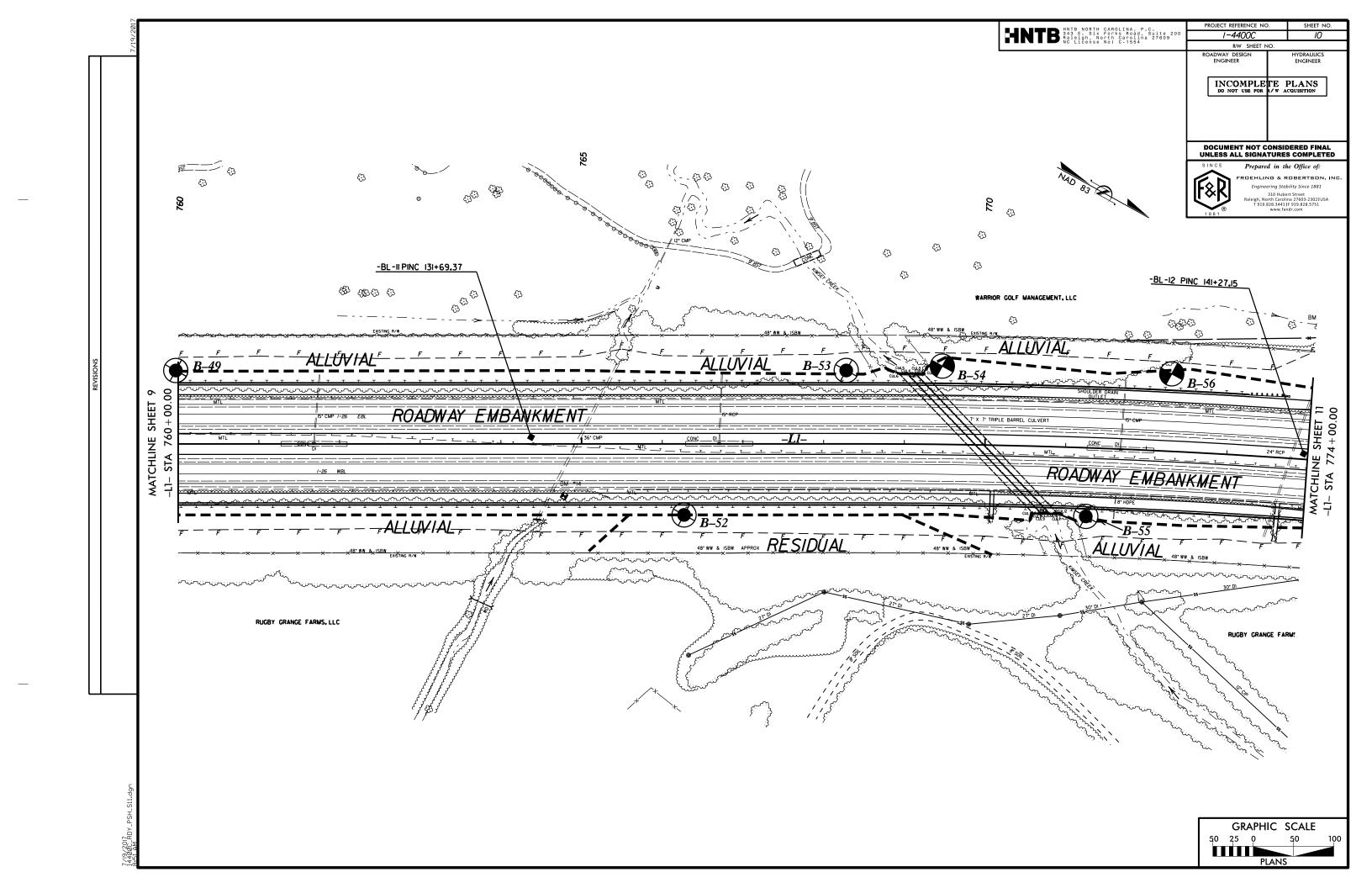
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2

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,  VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	\$(1/72(1/78	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED // NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS OPERANC MATERIALS	MINERALOGICAL COMPOSITION	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
LLASS. (≤ 35% PASSING "200) (> 35% PASSING "200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAQLIN, ETC.  ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	SURFACE. <u>CALCAREOUS (CALC.)</u> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-0 A-1-1-0 A-1-1-0 A-2-4 A-2-5 A-2-6 A-2-7 A-2-7 A-3-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	OF SLOPE.
7. PASSING	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
"10 50 MX GRANULAR SIL1" MUCK,	PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
#40 30 MX 50 MX 51 MN PEAT SOILS SOILS SOILS SOILS SOILS SOILS	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	HAMMER IF CRYSTALLINE.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 LL - 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 48 MX 41 MN 48 MX 41 MN SOILS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN LITILL UR HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOULS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS	ightharpoonup static water level after $24$ hours	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR PAIR TO POOR UNSUITABLE	∇ PW     PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
AS SUBGRADE POOR POOR ONSUTHBLE	SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS   LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	-	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
CONSISTENCY OR DENSENESS  RANGE OF STANDARD RANGE OF UNCONFINED	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE)  25/025  DIP & DIP DIRECTION  WITH SOIL DESCRIPTION  OF ROCK STRUCTURES	<u>IF TESTED, WOULD YIELD SPT REFUSAL</u>	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LODGE ( 4	SPT C SURPE INDICATOR	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT.
GENERALLY LOOSE 4 TO 10	SOIL SYMBOL  OPT ONT TEST BORING  INSTALLATION  SECTION OF THE PROPERTY OF THE	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.  IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
MATERIAL DENSE 10 10 30 N/A	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50		SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5	— INFERRED SOIL BOUNDARY — CORE BORING SOUNDING ROD	(V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u>	OF AN INTERVENING IMPERVIOUS STRATUM. <u>RESIDUAL (RES.) SOIL</u> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE  MONITORING WELL  TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
MATERIAL   STIFF   8 TO 15   1 TO 2	FIEZOMETER SPT N-VALUE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
HARD > 30 > 4	INSTHEEH ION —	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270  OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNDERCUT  UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE  UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
COARSE FINE	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER	ABBRE VIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY  MOD MODERATELY  7 - UNIT WEIGHT  CPT - CONE PENETRATION TEST  NP - NON PLASTIC  7 - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION OUBLE FOR FILES MOISTONE SESSMENTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS  DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.  STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO   SD SAND, SANDY   SS - SPLIT SPOON   F - FINE   SL SILT, SILTY   ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
LL _ LIQUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
PLASTIC   SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	FRAC FRACTURED, FRACTURES  TCR - TRICONE REFUSAL  RT - RECOMPACTED TRIAXIAL  FRAGS FRAGMENTS  Δ - MOISTURE CONTENT  CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: N/A; ELEVATIONS DERIVED FROM PROJECT DTM
(PI) PL PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	BENCH MARK: NA A; ELEVATIONS BENTYEB THOM THOSEST BIN
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: FEET
SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:  CME-45C CLAY BITS X AUTOMATIC MANUAL	MODERATELY CLOSE	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO	6. CONTINUOUS ELICHT AUGER	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
ATTAIN UPTIMUM MUISTURE	X CME-55	THINLY LAMINATED < 0.008 FEET  INDURATION	
PLASTICITY	<b>.</b>	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
PLASTICITY INDEX (PI) DRY STRENGTH  NON PLASTIC 0-5 VERY LOW	CME-550 HARD FACED FINGER BITS TUNGCARBIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST CASING WY ADVANCER HAND TOOLS:	GENILE BLOW BY HAMMER DISINIEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	HAND AUGER	CRAING ARE DISCIPLE TO SERARATE WITH STEEL PROPE.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT SOUNDING ROD VANE SHEAR TEST	INDURATED DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	Trinc Stichn 1231	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14
		SAMPLE BREAKS ALMUSS GRAINS.	DATE: 8-15-14



GROUND WTR (ft)

10.4

5.4

## GEOTECHNICAL BORING REPORT **BORE LOG**

		BORE LOG			,			
<b>WBS</b> 34232.1.1	TIP I-4400C COU	NTY HENDERSON	GEOLOGIST N. Consigli		<b>WBS</b> 34232.1.1	TIP I-4400C COU	NTY HENDERSON	GEOLOGIST S. Woods
SITE DESCRIPTION I-26 from	US 25 Business (Exit 44) to near	NC 280 (Exit 40): Extend Culvert 0	236 on Kimsey Creek	GROUND WTR (ft)	SITE DESCRIPTION 1-26 fr	rom US 25 Business (Exit 44) to near I	NC 280 (Exit 40): Extend Culver	rt 0236 on Kimsey Creek GROUND WTR
BORING NO. B-53	<b>STATION</b> 768+28	OFFSET 91 ft LT	ALIGNMENT -L1-	<b>0 HR.</b> N/A	BORING NO. B-54	<b>STATION</b> 769+46	OFFSET 97 ft LT	ALIGNMENT -L1- 0 HR. 1
<b>COLLAR ELEV.</b> 2,054.0 ft	TOTAL DEPTH 5.0 ft	<b>NORTHING</b> 626,443		<b>24 HR.</b> N/A	<b>COLLAR ELEV.</b> 2,056.2 ft	TOTAL DEPTH 15.0 ft	<b>NORTHING</b> 626,545	<b>EASTING</b> 949,665 <b>24 HR</b> .
DRILL RIG/HAMMER EFF./DATE N/	/A	DRILL METHOD H	and Auger <b>HAMM</b>	MERTYPE N/A	DRILL RIG/HAMMER EFF./DATE	E F&R5785 CME-55 80% 02/11/2017	DRILL METHOD	H.S. Augers HAMMER TYPE Automat
DRILLER D. Aiello	<b>START DATE</b> 08/09/17	<b>COMP. DATE</b> 08/09/17	SURFACE WATER DEPTH N	/A	DRILLER D. Aiello	<b>START DATE</b> 07/18/17	<b>COMP. DATE</b> 07/18/17	SURFACE WATER DEPTH N/A
ELEV Cft) DEIVE CFT BLOW COLUMN (ft) DEPTH CFT 0.5ft 0.5ft	<del></del>	OOT   SAMP.   L O NO.   MOI G	SOIL AND ROCK DESC ELEV. (ft)	CRIPTION DEPTH (ft)	(ft) ELEV (ft) o still	V COUNT         BLOWS PER FO           0.5ft         0.5ft	OOT SAMP. L C 75 100 NO. MOI G	SOIL AND ROCK DESCRIPTION
2001 BORE DOUBLE 14400C_GEO_CULV0236_BOREHOLES.GPJ NC_DOT.GDT 2/25/19			2,053.0 2,053.0 Loose, Brown, Silty Fine to (A-2-4) with Trace Mica, Or and Clay Medium Stiff, Red-Brown, Fi (A-4) with Trace II RESIDUAL Medium Stiff, Gray, Fine Sa with Trace Mica and Orga Boring Terminated at Elevati SILT (RESIDUAL Note: 1) PROPOSED CULVER 2049.6' UPSTREAM (RT of DOWNSTREAM (LT	ACE  Coarse SAND  ganics (Roots)  ine Sandy SILT  Mica  andy SILT (A-4)  anics (Roots)  ion 2,049.0 ft in  AL)  T INVERTS = f-L-) & 2047.7'	2060  2055  2,056.2 0.0 WOH  2,052.7 3.5 2  2050  2,047.7 8.5 2	2 23	M L	ROADWAY EMBANKMENT Dark Brown, Fine to Coarse Sandy Silty CLAY (A-6) with Trace Organics (Roots)  2,051.5  ALLUVIAL  Orange-Tan, Fine to Coarse Sandy Silty CLAY (A-7) with Trace Mica and Manganese   Deposits Dark Gray, Clayey Fine to Coarse SAND  2,044.2  Gray, Fine to Coarse Sandy SILT (A-4) with Trace Rock Fragments, Micaceous Boring Terminated at Elevation 2,041.2 ft in SILT (RESIDUAL)  Note: 1) 0.0-0.1' = SURFICIAL ORGANIC SOILS 2) PROPOSED CULVERT INVERTS = 2049.6' UPSTREAM (RT of -L-) & 2047.7' DOWNSTREAM (LT of -L-)

# GEOTECHNICAL BORING REPORT BORE LOG

WBS 34232.1.1  SITE DESCRIPTION I-26 from US  BORING NO. B-55				
	05 D : (F :: 44) : NO	HENDERSON	GEOLOGIST S. Woods	
BORING NO. B-55	5 25 Business (Exit 44) to near NC	280 (Exit 40): Extend Culvert 023	36 on Kimsey Creek	GROUND WTR (ft)
	<b>STATION</b> 771+28	OFFSET 85 ft RT	ALIGNMENT -L1-	<b>0 HR</b> . N/A
COLLAR ELEV. 2,056.7 ft	TOTAL DEPTH 3.8 ft	<b>NORTHING</b> 626,790	<b>EASTING</b> 949,742	<b>24 HR</b> . N/A
DRILL RIG/HAMMER EFF/DATE N/A		DRILL METHOD Hand	d Auger HAMME	RTYPE N/A
DRILLER D. Aiello	<b>START DATE</b> 08/14/17	COMP. DATE 08/14/17	SURFACE WATER DEPTH N//	Α
DRIVE   DEPTH   BLOW COUNT   (ft)   0.5ft	<del> </del>	75 100 SAMP. V L O MOI G E	SOIL AND ROCK DESC	RIPTION DEPTH (ft
2055		S-5 46% N 2 Sat 000	ROUND SURFA ROADWAY EMBANK Soft, Dark-Gray, Fine to Cc (layey SILT (A-5) with Trac (Roots) and Mic Soft, Dark Gray, Fine Sandy 3 Trace Organics (Roots), Gra ALLUVIAL Loose, to Medium Dense, B Coarse SAND (A-1-b) with 7 Boring Terminated at Elevatic SAND (ALLUVIA  Note: 1) Hand auger refusa 2) PROPOSED CULVERT 2049.6' UPSTREAM (RT of DOWNSTREAM (LT	MENT parse Sandy se Organics a SILT (A-4) with vel, and Mica rown, Fine to frace Gravel on 2,052.9 ft in L)  Lat 3.8' INVERTS = -L-) & 2047.7'

SHEET 5

REFERENCE

36030

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

**CONTENTS** 

SHEET NO. **DESCRIPTION** TITLE SHEET LEGEND (SOIL) SITE PLAN & PROFILE

# **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY _	HENDERSON						
		I-26 FROM US-25 BUS (EXIT 44)					
		TO NEAR NC-280 (EXIT 40)					
SITE DESC	RIPTION	PROPOSED RET WALL 099					
	ADJACENT I	I-26 WB @ EXIT 44 (MTN HOME RD)					

STATE PROJECT REFERENCE NO. 3 I-4400C

#### **CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNDS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE DESTREE CONDITIONS NDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY YARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS,

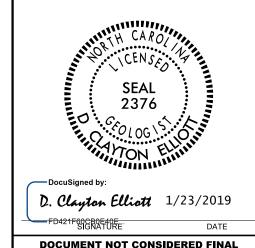
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DIES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:

  1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.

  2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

	DC CHEEK
	CJ COFFEY
	CD JOHNSON
	DC ELLIOTT
INVESTIGATED	BY DC ELLIOTT
	OC ELLIOTT
	JC KUHNE
SUBMITTED BY	JC KUHNE
DATE	



**UNLESS ALL SIGNATURES COMPLETED** 

PROJECT REFERENCE NO. SHEET NO.

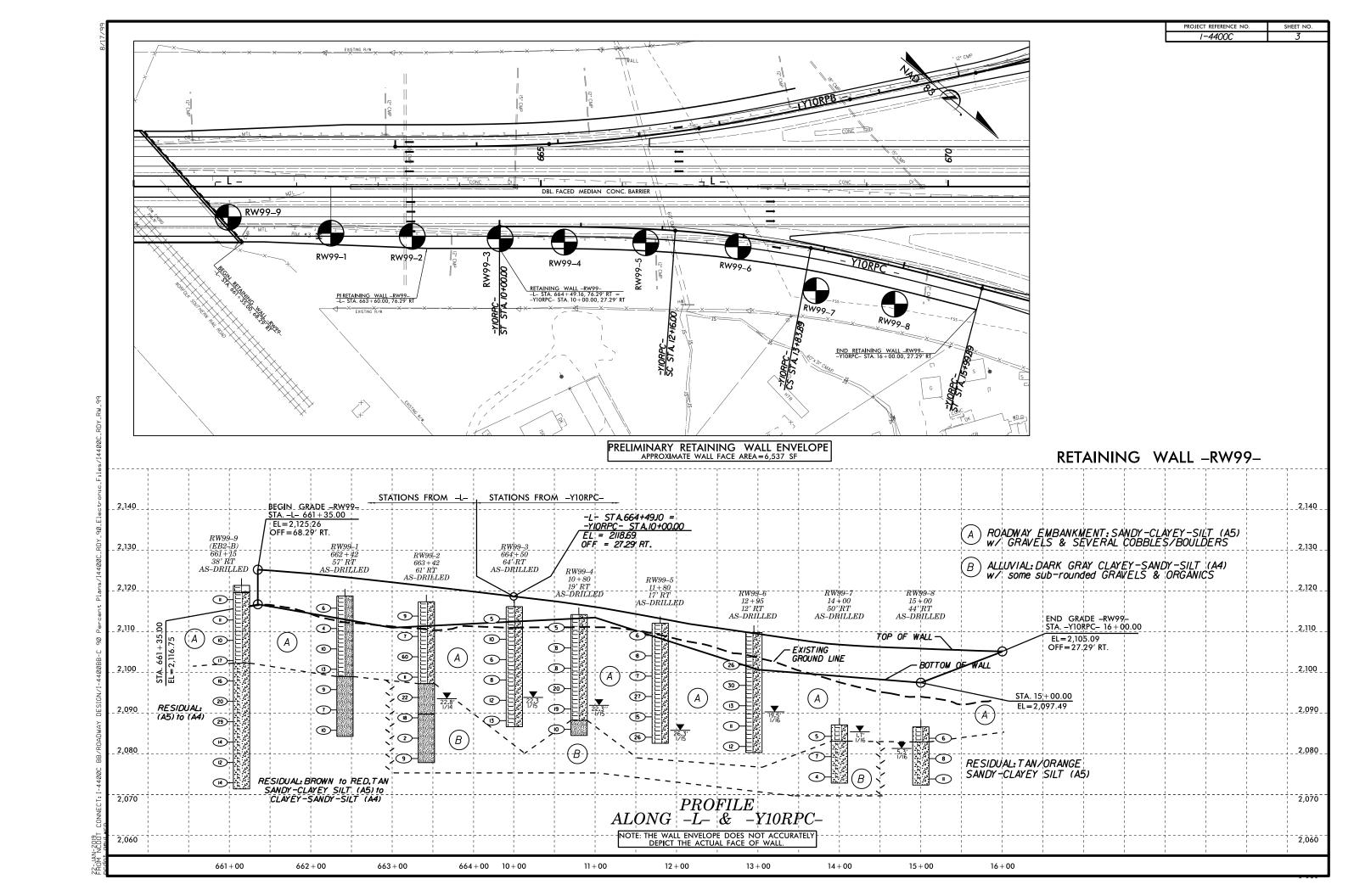
1–4400C

2

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST ICASTIOT 226, ASTM DISSOS, LOLASSIFICATION IS BASED ON THE AGSHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING; CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANDULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.  UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.  GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.  ANGULARITY OF GRAINS  THE ANGULARITY OR ROUNDRESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EDUAL TO OR LESS THAN Ø.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK, ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER,  AQUIFER - A WATER BEARING FORMATION OR STRATA,  ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND,  ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 1900 BLOWS PER FOOT IF TESTED.	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION  MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAQLIN, ETC.  ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GMEISS, GABBRO, SCHIST, ETC.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.  CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 GLASS. A-1-6 A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-1, A-2 A-4, A-5 A-6, A-7 A-6, A-7 A-6, A-7 A-7, A-7, A-7, A-7, A-7, A-7, A-7,	COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LL < 31	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD VEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
Z PASSING SILT.	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED (CP) SHELL BEDS, ETC.	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
**10 59 MX   GRANULAR CLAY   MUCK, CLAY   FEAT   **200   15 MX   25 MX   18 MX   35 MX   35 MX   35 MX   35 MX   36 MN	PERCENTAGE OF MATERIAL  ORGANIC MATERIAL  ORGANIC MATERIAL  ORGANIC MATERIAL  ORGANIC MATERIAL  ORGANIC MATERIAL	WEATHERING FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
MATERIAL PASSING #40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HANMER IF CRYSTALLINE.  VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
LL - 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN LITTLE OR LITTLE OR HIGHLY ORGANIC	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 22% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
USUAL TYPES STONE FRAGS. CINE SULTY OF CLAYEY SULTY CLAYEY MATTER	GROUND WATER  WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  FISSILE - A PROPERTY OF SPLITING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL AND SAND SAND GRAVEL AND SAND SOILS SOILS  GEN RATING  GEN RATING  GEN RATING  GEN RATING  GEN RATING	▼ STATIC WATER LEVEL AFTER 24 HOURS ▼PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
	SPRING OR SEEP	OULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM, FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	FIELD.  JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY PENETRATION RESISTENCE (N-VALUE) (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION WITH SOIL DESCRIPTION → OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL  SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
GENERALLY VERY LOOSE	SOIL SYMBOL  SOIL	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.  IF TESTED, WOULD SYELD SYT N VALUES > 100 BPF	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50 (NON-COHESIVE) VERY DENSE > 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT AUGER BORING TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD  TEST BORING  MONITORING WELL  TEST BORING	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF	OF AN INTERVENING IMPERVIOUS STRATUM.  RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	INFERRED ROCK LINE  MONITORING WELL  WITH CORE  WITH CORE  INSTALLATION  SPT N-VALUE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270  OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.  HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
BOULDER	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.  MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.  SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
GRAIN MM 305 75 2.0 0.25 0.05 0.005	ABBRE VIATIONS  AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	OR SLIP PLANE.  STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3  SOIL MOISTURE - CORRELATION OF TERMS	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED  CL CLAY  MOD MODERATELY  CPT - CONE PENETRATION TEST  NP - NON PLASTIC  7 - DRY UNIT WEIGHT	MEDIUM CAN BE GROOVED OR COUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.  CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION  GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC  DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE LIQUID LIMIT	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE	PIECES CAN BE BROKEN BY FINGER PRESSURE.  VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS MITHIN A STRATUM EQUAL TO 0R GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC SEMISOLID; REQUIRES DRYING TO	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(PI) PL PLASTIC LIMIT	FRAGS FRAGMENTS $w$ - MOISTURE CONTENT CBR - CALIFORNIA BEARING HI HIGHLY V - VERY RATIO	FRACTURE SPACING BEDDING  TERM SPACING TERM THICKNESS	BENCH MARK:
ON CONTINUE MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: FEET
OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:    X CME-45C	MODERATELY CLOSE	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6° CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	FIAD - FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY	X 8'HOLLOW AUGERS	INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	BOREHOLE ELEVATIONS TAKEN FROM THE RELEVANT BASELINE'S
PLASTICITY INDEX (PI)         DRY STRENGTH           NON PLASTIC         0-5         VERY LOW           SLIGHTLY PLASTIC         6-15         SLIGHT	CME-550	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS:  GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	CROSS SECTIONS
MODERATELY PLASTIC	CASING W/ ADVANCER POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	NOTE FROM OTH ONE WALL ROPING ALSO LIKE THE ORIGINAL TO A STATE OF THE ORIG
COLOR	PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER TRICONE TRICONE SOUNDING ROD	BREAKS EASILY WHEN HIT WITH HAMMER.  GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	••NOTE: FROM GEU: ONE WALL BORING ALSO HAS THE ORIGINAL "B-x" DESIGNATOR INCLUDED IN THE WALL BOREHOLE NAME TO CORRELATE w. THE ORIGINAL NAME OF THAT BORING FROM A 2001BRDG DRILLING PROGRAM
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	CORE BIT VANE SHEAR TEST	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1-
		SHIFTED HEROSS UNHINS.	DATE: 8-13-14



**CONTENTS** 4400C SHEET NO. REFERENCE 4 3 **PROIEC** 

**DESCRIPTION** 

LEGEND (SOIL & ROCK)

SITE PLAN & PROFILE

TITLE SHEET

BORE LOG(S) SOIL TEST RESULTS STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

# **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY HENDERSON

PROJECT DESCRIPTION <u>I-26 FROM US 25 BUSINESS</u> (EXIT 44) TO NEAR NC 280 (EXIT 40)

SITE DESCRIPTION RETAINING WALL 101 ON -L- FROM 676+00 TO 678+50, 65.5' RIGHT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4400C	1	5

#### **CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR NSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-680. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (INP-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE TOTAL WITH THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT, FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:

  1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.

  2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

S. WOODS S. DAVIS T. BEARD INVESTIGATED BY  $F \otimes R$ , Inc.DRAWN BY \_T.T. WALKER CHECKED BY \_D. RACEY SUBMITTED BY P. ALTON, P.E. DATE JANUARY 2019

PERSONNEL



### Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

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1/30/2019 Patrick

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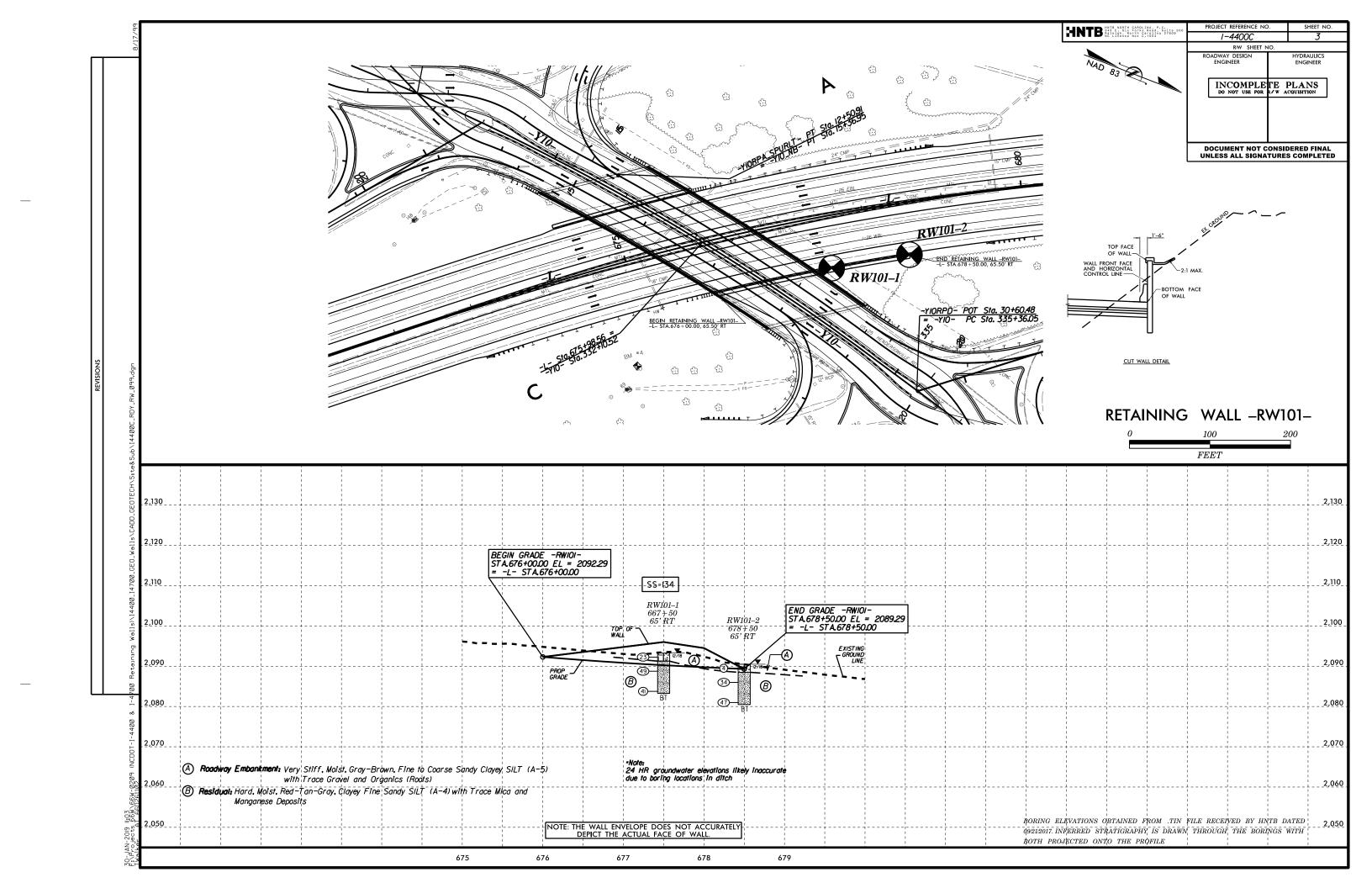
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PROJECT REFERENCE NO.	SHEET NO.
I-4400C	2

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6  SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED VILLE NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.  ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
CEMERAL CRANIII AR MATERIALS SILT-CLAY MATERIALS	MINERALOGICAL COMPOSITION	FINE TO COARSE CRAIN ICNEOUS AND METAMORPHIC POCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE ROCK (CR)  WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	SURFACE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-0 A-1-1-1 A-2-4 A-2-5 A-2-6 A-2-7 A-4-7-5 A-3 A-6, A-7	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.  COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
0000000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR)  SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
2 PASSING   GRANULAR SILT- MUCK,	HIGHLY COMPRESSIBLE LL > 50  PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
#40 30 MX 50 MX 51 MN SOILS CLIAY PEAT	GRANULAR SILT - CLAY	- WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
IN AC IN BELL AND COLUMN AC IN AND COLUMN CO	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL  TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING *40	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.  VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN.	HORIZONTAL.
LL 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 50015 WITH	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
PI 6 MX NP 18 MX 18 MX 11 MN 11 MN 10 MX 18 MX 11 MN 11 MN MODERATE ORGANIC GROUP INDEX 8 0 0 8 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF	GROUND WATER	OF A CRYSTALLINE NATURE,	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOILS  USUAL TYPES STONE FRAGS. FINE SOLVEY OF SOLVEY SOLVEY.		SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SANU	▼ STATIC WATER LEVEL AFTER <u>24</u> HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN (MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	√PW     PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA     O	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP	WITH FRESH ROCK.	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED	ET	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPRESSIVE STRENGTH  CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH  (N-VALUE) (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE)  ### ROADWAY EMBANKMENT (RE)  ### DIP DIRECTION  OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL  SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
CENERALLY VERY LOOSE < 4	SPT CLODE NOTESTED	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GENERALLY LOOSE 4 TO 10 GRANULAR MEDIUM DENSE 10 TO 30 N/A	VST PMT INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.  IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT AUGER BORING TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
VERT DENSE / DU		SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
VERY SOFT         < 2         < 0.25           GENERALLY         SOFT         2 TO 4         0.25 TO 0.5	- INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY         MEDIUM STIFF         4 TO 8         0.5 TO 1.0           MATERIAL         STIFF         8 TO 15         1 TO 2	INFERRED ROCK LINE MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	PIEZOMETER SPT N-VALUE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
HARD > 30 > 4	INSTALLATION	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
COARSE FINE	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL SAND SAND SILT CLAY		MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(LSE, SU.) (F SU.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY MOD MODERATELY 7 - UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOU MOISTURE SCALE FIFLD MOISTURE	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{ m d}$ - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK.  SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS)  DESCRIPTION  GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE.  VERY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES I INCH	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC SEMISOLIDA PEOULIPES DRYING TO	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE - WEI - (W) ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK: N/A
""PLL + PLASTIC LIMIT	EQUIPMENT USED ON SUBJECT PROJECT	TERM SPACING TERM THICKNESS  VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: N/A FEET
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	ELEVHITON: N/ A FEET
SL SHRINKAGE LIMIT	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE Ø.16 TO 1 FOOT VERY THINLY BEDDED Ø.03 - Ø.16 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6' CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	FIAD= FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY	X CME-55   CORE SIZE:     CORE SIZE:     -B   -H	INDURATION	BORING ELEVATIONS OBTAINED FROM .TIN FILE RECEIVED
PLASTICITY INDEX (PI) DRY STRENGTH		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	FROM HNTB ON 9/21/2017
NON PLASTIC 0-5 VERY LOW	TUNGCARBIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS;	The same of the contract of th
SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST CASING WY ADVANCER HAND TOOLS:	GENILE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TOTAL TOTAL	CRAING ARE DIFFICULT TO CERARATE WITH CIFFL PROPE.	
	The second results and the second results are second results and the second results are second results and the second results are second results and the second results are second resul	INDURATED DIFFICULT TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).  MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	CORE BIT VANE SHEAR TEST	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
		SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14



# GEOTECHNICAL BORING REPORT BORE LOG

		ORE LOG											
<b>WBS</b> 34232.1.FS4		TY HENDERSON	GEOLOGIST S. Woods		<b>S</b> 34232.1.FS4				Y HENDER			GEOLOGIST S. Woods	T
SITE DESCRIPTION Retaining Wa	·	<del>-</del>	GROUND WTR (ft)	-				101 on -L- from 676+00 to 678				1	GROUND WTR (ft)
BORING NO. RW101-1	STATION 677+50	OFFSET 65 ft RT	ALIGNMENT -L- 0 HR. Dry		RING NO. RW1			<b>TATION</b> 678+50	OFFSET 6			ALIGNMENT -L-	<b>0 HR</b> . Dry
COLLAR ELEV. 2,093.3 ft	TOTAL DEPTH 10.0 ft	NORTHING 618,883	<b>EASTING</b> 954,581 <b>24 HR.</b> 0.0		LAR ELEV. 2,			OTAL DEPTH 10.0 ft	NORTHING				<b>24 HR.</b> 0.0
DRILL RIG/HAMMER EFF./DATE F&R2		DRILL METHOD H.						5 CME-55 82% 02/20/2018		DRILL METH			IER TYPE Automatic
DRILLER S. Davis	<b>START DATE</b> 11/30/18	COMP. DATE 11/30/18	SURFACE WATER DEPTH N/A		LLER S. Davis			TART DATE 11/30/18	COMP. DAT		8	SURFACE WATER DEPTH N	/A
ELEV CHIP CHIP CHIP CHIP CHIP CHIP CHIP CHIP	I	T SAMP. V L O NO. MOI G	SOIL AND ROCK DESCRIPTION  ELEV. (ft) DEPTH (ft)	ELEV (ft)	/ DRIVE DEPTH (ft)	BLOW CC		BLOWS PER FOOT 0 25 50	75 100	NO. M	OI G	SOIL AND ROCK DES	CRIPTION
(ft) (ft) (ft) 0.5ft 0.5ft 0.  2095 2,093.3 0.0 1 14 14 15	9	75 100 NO. MOI G  SS-134 26%   NO. MOI G  MOI G  MOI G			2,090.5= 0.0 2,087.0 3.5	0.5ft 0.5ft  WOH 2  3 4	0.5ft	0 25 50	75 100	/	OI G	SOIL AND ROCK DESC	ACE 0.0  KMENT Sandy Clayey el and Organics  e Sandy SILT I Manganese  10.6  ion 2,080.5 ft in AL)

# North Carolina Department of Transportation Division of Highways Materials and Test Unit Soils Laboratory

T.I.P. ID NO.: I-4400C

DESCRIPTION: Retaining Wall 101 on -L- from 676+00 to 678+00, 65.5' Right

REPORT ON SAMPLES OF: SOIL FOR QUALITY

 WBS No.:
 34232.1.FS4
 COUNTY:
 Henderson

 DATE SAMPLED:
 11/18
 RECEIVED:
 12/18

 SAMPLED FROM:
 -L REPORTED:
 12/18

 SUBMITTED BY:
 D. Racey
 BY:
 D. Council Cert No. 101-02-0603

### TEST RESULTS

PROJ. SAMPLE NO.	SS-134					
BORING NO.	RW101-1					
Retained #4 Sieve %	16.8					
Passing #10 Sieve %	78.0					
Passing #40 Sieve %	66.4					
Passing #200 Sieve %	47.2					

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	23.1					
Fine Sand Ret - #270 %	20.6					
Silt 0.053 - 0.010 mm %	28.8					
Clay < 0.010 mm %	27.5					
L.L.	43					
P.L.	34					
P.I.	9					
AASHTO Classification	A-5 (2)					
Station	677+50					
Offset	65' RT					
Depth (ft)	0.1					
to	1.5					
Alignment	-L-					
Moisture Content (%)	25.7					
Organic Content (%)	NT					

NP = Not plastic

NT = Not tested

ND = Not Determined

CL = Centerline

W.P. Alton, P.E.

Soils Engineer

REFERENCE

**CONTENTS** 

**DESCRIPTION** 

LEGEND (SOIL & ROCK)

SITE PLAN AND PROFILE

TITLE SHEET

SHEET NO.

36030

## STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

# **STRUCTURE** SUBSURFACE INVESTIGATION

OUNTY HENDERSON
PROJECT DESCRIPTION <u>RETAINING WALL -RW100-</u>
-L- STA 660+13.21, 68.29'LT
TO -Y10RPB- STA 15+00, 27.29'LT
SITE DESCRIPTION

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I4400C	1	3

#### **CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE DESCREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTICATIONS ARE AS RECORDED AT THE TIME OF THE INVESTICATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

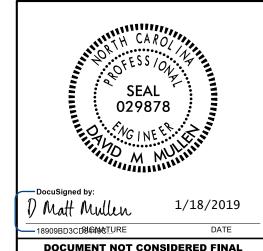
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS, AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:

  1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.

  2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

CD JOHNSON DC ELLIOT DO CHEEK CJ COFFEY INVESTIGATED BY <u>DM</u> MULLEN DRAWN BY \_DM MULLEN CHECKED BY JC KUHNE SUBMITTED BY JC KUHNE 



**UNLESS ALL SIGNATURES COMPLETED** 

PROJECT REFERENCE NO. SHEET NO. 2

# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

# SUBSURFACE INVESTIGATION

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS ELIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SDIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
VERY STIFF,GRAY,SILTY CLAY,MOIST WITH INTERBEDDED FINE SAND LAYERS,HIGHLY PLASTIC,A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS CLASS. (≤35% PASSING *200) (>35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	SURFACE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	UNEISS, CHEBRO, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-0 A-1-6 A-2-4 A-2-5 A-2-6 A-2-7 A-7-6 A-3 A-6, A-7	COMPRESSIBILITY	BOOK (NICE) SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.
7. PASSING	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK STYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
"10 50 MX GRANULAR SIL1" MUCK,	PERCENTAGE OF MATERIAL	CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*40    30 MX   50 MX   51 MN   SOILS   SOILS   PEAT   *200    15 MX   25 MX   10 MX   35 MX   35 MX   35 MX   36 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3%, 3 - 5%, TRACE 1 - 10%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 SOILS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
LL   -   -   40 MX   41 MN   40 MX   41 MN   40 MX   41 MN   40 MX   41 MN   LITTLE OR HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
CROLIP INDEX A A A A MY 8 MY 12 MY 16 MY NO MY AMOLINTS OF ORGANIC	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
USIAL TYPES STONE FRACS ORGANIC SUILS	▼ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL, AND SAND SAND SAND SAND SAND SAND SAND	STATIC WATER LEVEL AFTER 24 HOURS	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SANU	✓ PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS, IN (MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GEN. RATING AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR POOR UNSUITABL	E I	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	— SPRING OR SEEP	WITH FRESH ROCK.	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
COMPACTNIESS OR RANGE OF STANDARD RANGE OF UNCONFINED	TT 25,425	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE CONFIGURESS ON PENETRATION RESISTENCE COMPRESSIVE STRENGTH (N-VALUE) (TONS/FT <sup>2</sup> )	ROADWAY EMBANKMENT (RE) 25/825 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE 6.4	SPT SURPE INDICATOR	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT.
CRANIII AP LOOSE 4 TO 10	SOIL SYMBOL DIPT DMT TEST BORING INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
MATERIAL MEDIUM DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT TEST	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF  VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THAN ROADWAY EMBANKMENT THOUSEN BURLING TEST	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	── INFERRED SOIL BOUNDARY ————————————————————————————————————	(V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	WITH CURE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	TTT++  ALLUVIAL SOIL BOUNDARY  △ FIEZUMETER  INSTALLATION  — SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	- ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
U.S. STD. SIEVE SIZE 4 10 40 60 200 270		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	ROCK.  SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNSUITABLE WASTE  ACCEPTABLE, BUT NOT TO BE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - COSED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBRE VIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY MOD MODERATELY 7 - UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOLI MOISTURE SCALE FIELD MOISTURE	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{ m d}$ - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK.  SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS)  DESCRIPTION  GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u>	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC CONTROL TO COMPANY TO COM	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK: BM#3
(PI) PL PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 2118.85 FEET
SL _ SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO	X CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE	
- DRY - (U) ATTAIN OPTIMUM MOISTURE	CME-55 6° CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	
PLASTICITY	X 8* HOLLOW AUGERS	INDURATION	1
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC 0-5 VERY LOW	TUNGCARBIDE INSERTS	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST CASING W/ ADVANCER HAND TOOLS:  POST HOLE DIGGER	COANG CAN DE CEDADATED FROM CANDIE MITH CTEEL DOOR	
HIGHLY PLASTIC 26 OR MORE HIGH	DODIANI E HOICE TRICONE CETEL TEETH	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE	CRAINS ARE DISCISLED TO SERARATE WITH STEEL PROPE.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY),	CORE BIT SUUNDING RUU  VANE SHEAR TEST	INDURATED DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
		SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1

